# AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been divided into sections.

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SECTION: 3 OF 3

DOCUMENT #: 07-AMCP-0198

TITLE: Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group OU Remedial Investigation/Feasibility Study (RI/FS) Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-IS-1 and 200-ST-1 OUs DOE/RL-2002-14 Rev1 Draft B

# APPENDIX C

# SAMPLING AND ANALYSIS PLAN FOR THE 241-CX-72 STORAGE TANK

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## TERMS

| | |
|---|---|
| AEA | alpha energy analysis |
| AG | amber glass |
| ALARA | as low as reasonably achievable |
| ASTM | American Society for Testing and Materials |
| bgs | below ground surface |
| CAS | Chemical Abstracts Service |
| CERCLA | *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* |
| CLARC | *Cleanup Levels and Risk Calculations under the Model Toxics Control Act Regulation* (CLARC Version 3.1) (Ecology 94-145) |
| CFR | *Code of Federal Regulations* |
| COPC | contaminant of potential concern |
| CVAA | cold vapor atomic absorption |
| DOE | U.S. Department of Energy |
| d/min | disintegrations per minute |
| DQO | data quality objective |
| EPA | U.S. Environmental Protection Agency |
| FS | feasibility study |
| GEA | gamma energy analysis |
| GPC | gas proportional counting |
| GW | groundwater |
| HEIS | *Hanford Environmental Information System* database |
| IC | ion chromatograph |
| ICP | inductively coupled plasma |
| ICP/MS | inductively coupled plasma/mass spectrometry |
| IDW | investigation-derived waste |
| N/A | not applicable |
| NaI | sodium iodide |
| NCEA | National Center for Environmental Assessment |
| ORP | DOE, Office of River Protection |
| OU | operable unit |
| $ppm_v$ | parts per million volume |
| PUREX | Plutonium-Uranium Extraction (Plant or process) |
| QA | quality assurance |
| QAPjP | quality assurance project plan |
| QC | quality control |
| RCRA | *Resource Conservation and Recovery Act of 1976* |
| RESRAD | RESidual RADioactivity (dose model) |
| RfD | reference dose |
| RL | DOE, Richland Operations Office |
| SAP | sampling and analysis plan |
| STOMP | Subsurface Transport Over Multiple Phases (code) |
| TBD | to be determined |
| TSD | treatment, storage, and/or disposal (unit) |

| | | |
|---|---|---|
| 1 | VOA | volatile organic analyte |
| 2 | WAC | *Washington Administrative Code* |
| 3 | WTPH-D | Washington State total petroleum hydrocarbons – diesel range |
| 4 | WTPH-G | Washington State total petroleum hydrocarbons – gasoline range |

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## METRIC CONVERSION CHART

| Into Metric Units | | | Out of Metric Units | | |
|---|---|---|---|---|---|
| *If you know* | *Multiply by* | *To get* | *If you know* | *Multiply by* | *To get* |
| **Length** | | | **Length** | | |
| inches | 25.40 | millimeters | millimeters | 0.0394 | inches |
| inches | 2.54 | centimeters | centimeters | 0.394 | inches |
| feet | 0.305 | meters | meters | 3.281 | feet |
| yards | 0.914 | meters | meters | 1.094 | yards |
| miles (statute) | 1.609 | kilometers | kilometers | 0.621 | miles (statute) |
| **Area** | | | **Area** | | |
| sq. inches | 6.452 | sq. centimeters | sq. centimeters | 0.155 | sq. inches |
| sq. feet | 0.0929 | sq. meters | sq. meters | 10.764 | sq. feet |
| sq. yards | 0.836 | sq. meters | sq. meters | 1.196 | sq. yards |
| sq. miles | 2.591 | sq. kilometers | sq. kilometers | 0.386 | sq. miles |
| acres | 0.405 | hectares | hectares | 2.471 | acres |
| **Mass (weight)** | | | **Mass (weight)** | | |
| ounces (avoir) | 28.349 | grams | grams | 0.0353 | ounces (avoir) |
| pounds | 0.453 | kilograms | kilograms | 2.205 | pounds (avoir) |
| tons (short) | 0.907 | ton (metric) | ton (metric) | 1.102 | tons (short) |
| **Volume** | | | **Volume** | | |
| teaspoons | 5 | milliliters | milliliters | 0.034 | ounces (U.S., liquid) |
| tablespoons | 15 | milliliters | liters | 2.113 | pints |
| ounces (U.S., liquid) | 29.573 | milliliters | liters | 1.057 | quarts (U.S., liquid) |
| cups | 0.24 | liters | liters | 0.264 | gallons (U.S., liquid) |
| pints | 0.473 | liters | cubic meters | 35.315 | cubic feet |
| quarts (U.S., liquid) | 0.946 | liters | cubic meters | 1.308 | cubic yards |
| gallons (U.S., liquid) | 3.785 | liters | | | |
| cubic feet | 0.0283 | cubic meters | | | |
| cubic yards | 0.764 | cubic meters | | | |
| **Temperature** | | | **Temperature** | | |
| Fahrenheit | (°F-32)*5/9 | Centigrade | Centigrade | (°C*9/5)+32 | Fahrenheit |
| **Radioactivity** | | | **Radioactivity** | | |
| picocurie | 37 | millibecquerel | millibecquerel | 0.027 | picocurie |

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# APPENDIX C

# SAMPLING AND ANALYSIS PLAN FOR THE 241-CX-72 STORAGE TANK

## C1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) directs the activities to be performed to characterize the waste contents within the *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal (TSD) unit CX-241-72 Storage Tank in the 200-IS-1 Operable Unit (OU).

The sampling and analyses described in this document will provide data to characterize the waste contents within the 241-CX -72 Storage Tank. Characterization activities described in the SAP are based on implementing the data quality objective (DQO) process. Elements of this SAP were derived from the DQO processes undertaken for the CX-241 Tank System, and include content previously presented in DOE/RL-2002-14, Rev. 0, Appendix B, and DOE/RL-2002-14, Rev. 1, Draft A, Appendix B.

## C1.1 200-IS-1 OPERABLE UNIT AND WASTE-SITE LOCATION

The 241-CX-72 Storage Tank is located within the Hanford Site in south-central Washington State, at the former Hot Semiworks Facility, east of B Plant in the 200 East Area. This waste site is located within the exclusive land-use boundary identified in DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement.*

## C1.2 SITE DESCRIPTION AND HISTORY

The following subsections briefly describe the 241-CX-72 Storage Tank included in this SAP.

### C1.2.1 241-CX Tank System

The 241-CX Tank System consists of the following three tanks: 241-CX-70 Storage Tank, 241-CX-71 Neutralization Tank, and 241-CX-72 Storage Tank (Figure C-1). The tanks no longer receive waste. Prior process uses and the status of the 241-CX-72 Storage Tank are summarized in the following discussion.

### C1.2.2 241-CX-72 Storage Tank

This tank was used for approximately 1 year in 1956 when 8,725 L (2,305 gal) of waste were transferred into the tank for storage. The 241-CX-72 Storage Tank also was used to study the concentration of waste generated from the Hot Semiworks Facility pilot studies. Decontamination flushes from the Hot Semiworks Facility also might have been sent to the

241-CX-72 Storage Tank. Between December 1956 and May 1957, the waste in the tank was heated until enough liquid evaporated that it was nearly dry. From 1960 through 1967, the 241-CX-72 Storage Tank remained idle until it was taken out of service in 1967. In 1986, the 241-CX-72 Storage Tank was decommissioned and filled with approximately 7.3 m (24 ft) of grout over a 3.4 m (11-ft) heel consisting of non-liquid waste. Gamma spectroscopic, relative axial neutron flux profile, axial temperature profile, and axial dose rate profile measurements were taken from a periphery drywell to estimate remaining radionuclide content (Figure C-2). The 11-ft-thick sludge/waste heel at the bottom of the tank contains fission products and transuranium isotopes. The design capacity of the 241-CX-72 Storage Tank is 8,860 L (2,340 gal).

Figure C-1. 241-CX Tank System Area Plan View.

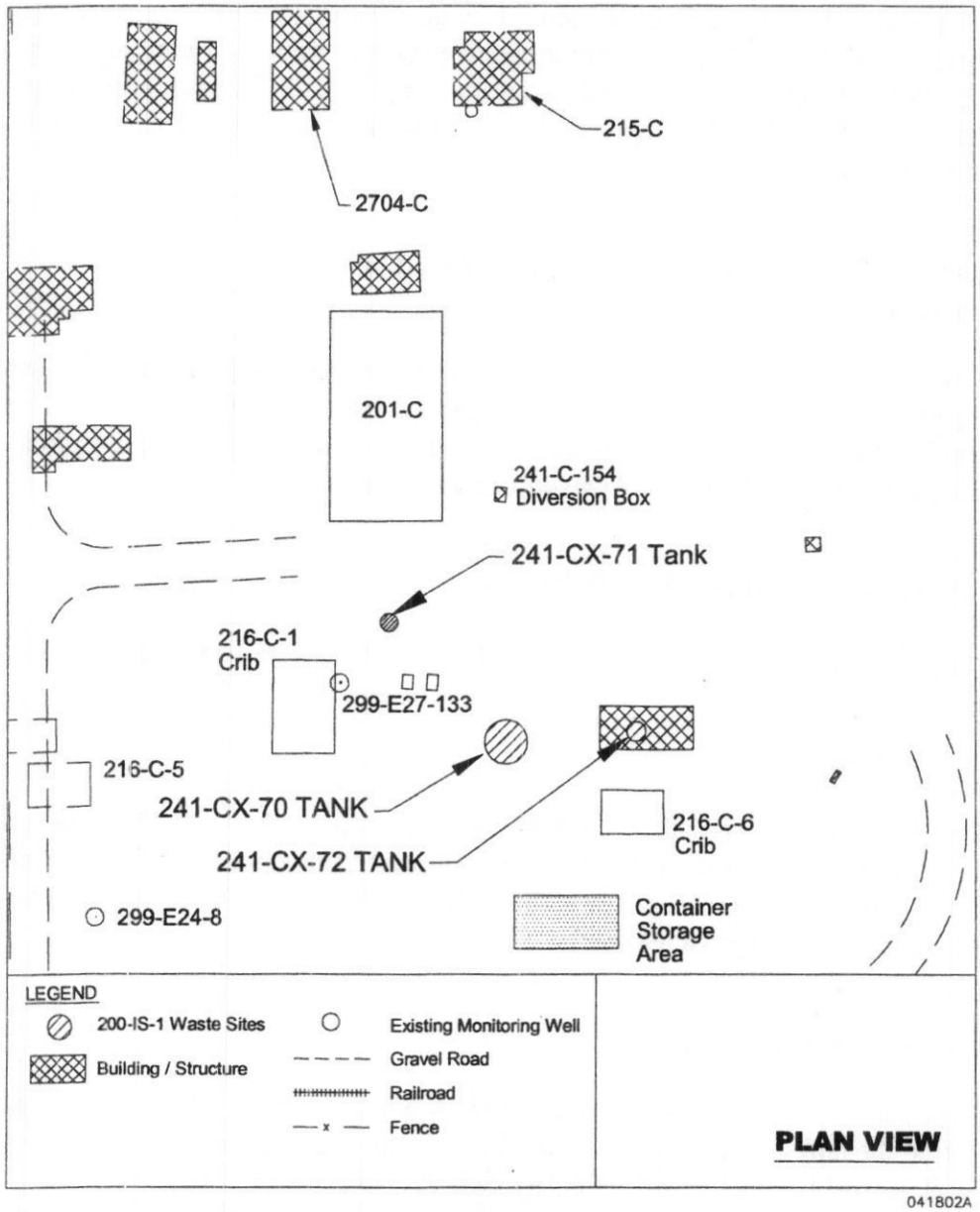
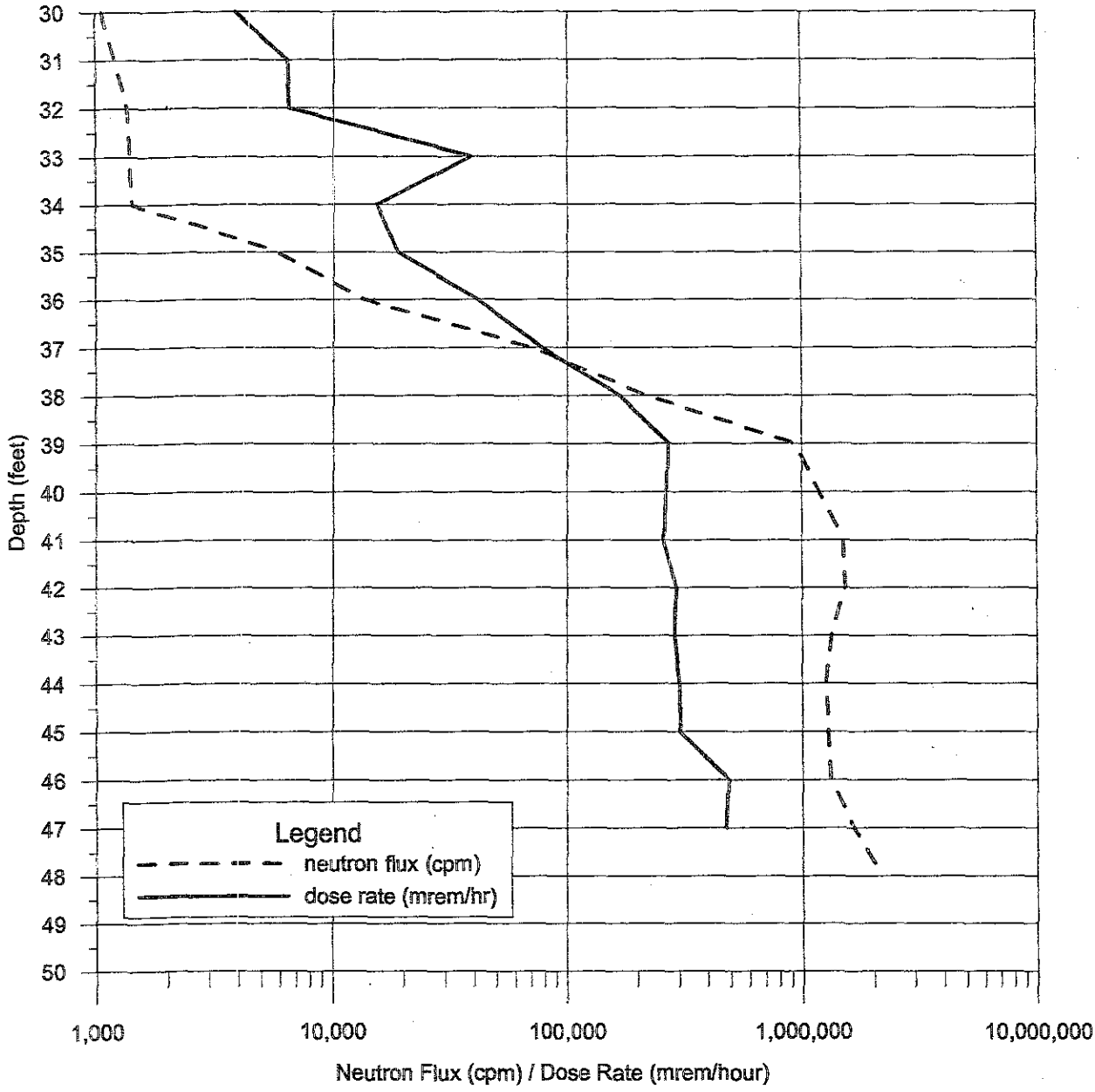


Figure C-2. Plot of Relative Axial Profile Neutron Flux and Dose Rate Measured in the 241-CX-72 Storage Tank.




NOTE: The flange at the top of the drywell was used as the reference point for the depths indicated in this plot. Bottom of the drywell was measured at 48 ft. Neutron flux measurements were taken in January and May 1989. Beta/gamma dose rate readings were taken subsequent to neutron measurements. Information source: WHC-SD-CP-TI-148, *Radiological Evaluation of Hot Semiworks Tank 241-CX-72*.

The tank is being managed under RCRA interim status and is identified in a Hanford RCRA Dangerous Waste Permit Application, Part A, Form 3. Based on a conservative designation, mixed waste could be present containing toxic constituents (D002, and D004 through D011), and state-only (WC02, WT01, and WT02). Information that has been compiled regarding the tank's prior and current inventory is presented in Table C-1.

A greenhouse (Figure C-3) and caisson were constructed over the tank in 1990 in support of a plan to remove the grout. The soil covering the upper portion of the tank and risers also was excavated in 1990, and a steel caisson was extended from grade level to the top of the tank. Because the tank contained an agitator assembly, mockup testing of grout removal activities was conducted from January to September 1992. The mockup testing was ultimately terminated due to problems encountered when drilling through the mockup of grout and embedded steel (WHC 1993, *Facility Decommissioning Report for Tank 241-CX-70*).

The top of the vessel is currently sealed with a plate that extends over and seals the caisson (Figure C-4). Five pipes extend from the tank to the above-grade level and two pipelines enter the tank underground. Pipe openings at the top of the tank include a 2-in. fill pipe, a 3-in. vapor pipe, a 4-in. dip tube nozzle, a 3-in. sealed test (dry) well, and two 8-in. access nozzles (HW-55963 RD, *The Self Concentration of High Level PUREX Wastes in The Hot Semiworks Waste Concentrator*). A manually operated agitator, extending above the tank, was used to manipulate five individual paddles. The bottom of the caisson is sealed with a 12-in.-thick reinforced grout plug that provides a base pad for the tank. The annulus between the tank and caisson remains empty. The caisson to access the risers and the top of the tank is covered with a protective lid located at floor-level in the greenhouse (BHI-01173, *Auditable Safety Analysis for Surveillance and Maintenance of the 241-CX Tank System*). An underground vault is located 9 ft to the north of the centerline of the tank (Figure C-5). The vault was used to support former waste concentration experiments and consisted of a mechanical pit, an instrument pit, and a sampler pit. Drawings H-2-71672, *Piping Plans 241CX Tanks 70 71 72*, and SK-2-56955, *Piping Plans 241-CX Tanks 70 71 72*, indicated that the waste streams entering the tank bypassed the vault. The vault was filled with grout in 1986 as part of the decommissioning activities (BHI-01173).

Table C-1. Summary Information for the 241-CX-72 Storage Tank. (2 Pages)

| Tank Identification | Facility Served | Tank Volume and Type | Tank Construction | Function | Tank Inventory (Based on Process Knowledge) | | | Tank Inventory (Based on Samples or Radiological Logging) | | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Nonradiological Constituents | Radiological Constituents | Volume Handled | Nonradiological Constituents | Radiological Constituents | |
| 241-CX-72 | 201-C Bldg, A and C cells | 2,000- to 2,300-gal experimental underground concentration tank[1,2] | Tank is vertically oriented; 40-in. diameter by 35.8 ft high; 0.38-in.-thick stainless steel plating with five stiffening rings around perimeter, connected by three rows of vertical guides; resting on concrete pad inside 6-ft diameter carbon-steel caisson; cylindrical heater located just above each stiffening ring; top of tank sealed with plate that extends over and seals the caisson; bottom of caisson sealed with 12-in. thick reinforced-grout plug that provides base for tank. Top of tank is 14 ft bgs; bottom is ~50 ft bgs.[1,2] | Designed, constructed, and used for terminal storage of waste associated with pilot PUREX waste concentration studies performed in A and C cells; tank also may have been used for fluids from decontamination of Hot Semiworks Facility after separations projects; investigations of bumping phenomenon were conducted in the tank.[1,7,8,11,12,13] | Chemical residues in sludge/ aggregate; minor compared to radiological source term[3] | Upperbound estimate: 200 g Pu, 10,000 Ci Cs-137[5,8,9] | 8,700 L (2,300 gal)[10] | Nondestructive assay (1989): fluorine compounds (see information in radiological constituents column)[8] | In-tank samples (1974): Pu (total) 1.13 E-8 g/gal, U (total) 2.43 E-3 g/gal, Sr-89/90 4.33 mCi/g, Cs-137 undetected;[4] (1988) 2,000 to 8,000 disintegrations per minute alpha, 2640 to 5810 pCi gamma, beta/gamma ratio of 25:1, estimated 9,000 to 10,000 Ci Cs-137.[4]<br><br>1989 nondestructive assay (gamma spectroscopic, relative axial neutron flux, neutron flux, axial temperature profile, and axial dose rate profile measurements) taken from periphery drywell (not direct samples): ~11-ft sediment layer consisting of fission products and transuranic isotopes at bottom of tank; suggested uniform distribution of activity in sludge layer, with likely higher concentration in bottom 2 to 3 ft of tank; activity layer is dry and does not contain hydrogenous materials to thermalize the neutrons generated within contents of the tank; axial temperature profile measurements of 60 °F to 72 °F indicated presence of heat-generating wastes; dose rates vary from 4 rem/h at 10 ft above sludge layer to 265 R/h at top of sludge layer, increasing to ~491 R/h at bottom of sludge layer; transuranic content likely is present in fluorides; plutonium content of sludge is between 150 and 200 g.[8] | Capped with grout; 650 gal of dried sludge in bottom[2,6] |

Table C-1. Summary Information for the 241-CX-72 Storage Tank. (2 Pages)

| Tank Identification | Facility Served | Tank Volume and Type | Tank Construction | Function | Tank Inventory (Based on Process Knowledge) | | | Tank Inventory (Based on Samples or Radiological Logging) | | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Nonradiological Constituents | Radiological Constituents | Volume Handled | Nonradiological Constituents | Radiological Constituents | |

bgs = below ground surface.
PUREX = Plutonium-Uranium Extraction (Plant or process).

[1]BHI-01173, *Auditable Safety Analysis for Surveillance and Maintenance of the 241-CX Tank System.*
[2]BHI-01018, *Environmental Restoration Contractor Management Plan for Inactive Miscellaneous Underground Storage Tanks (IMUSTS).*
[3]DOE-RL-92-18, *Semiworks Plant Source Aggregate Area Management Study Report.*
[4]AR00227, "Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72."
[5]WHC-SD-DD-SAD-001, *Safety Evaluation for Interim Waste Management Activities in Tank 241-CX-70, Tank 241-CX-71, and Tank 241-CX-72.*
[6]WHC-MR-0144, *Plan and Approach for Completion of Decommissioning of Strontium Semiworks Plant.*
[7]WHC-SD-DD-TI-040, *Tank 241-CX-72 Preliminary Waste Characterization.*
[8]WHC-SD-CP-TI-148, *Radiological Evaluation of Hot Semiworks Tank 241-CX-72.*
[9]WHC-SD-DD-TI-051, *An Estimation of the Radionuclide Content of Tank 241-CX-72.*
[10]HW-52860, *Standby Status Report for Hot Semi-Works Facility.*
[11]H-2-4093, *Hot Semi-Works Process Piping Plan A Cell.*
[12]H-2-4420, *Plot Plan Hot Semi-Works Waste Self-Concentrator.*
[13]H-2-4535, *Site Plan + Underground Piping Strontium Facilities.*

Figure C-3. Photograph of Containment Building (Greenhouse) Placed Over the 241-CX-72 Storage Tank in 1990 (Photo Taken December 1999).

Figure C-4. Photograph of Plate Covering Access Caisson to Top of Tank.

241-CX Tank System
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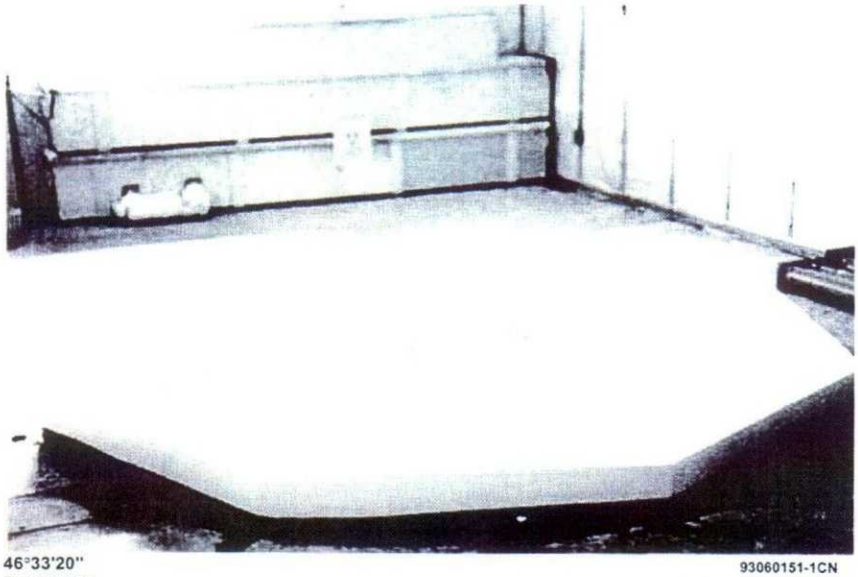
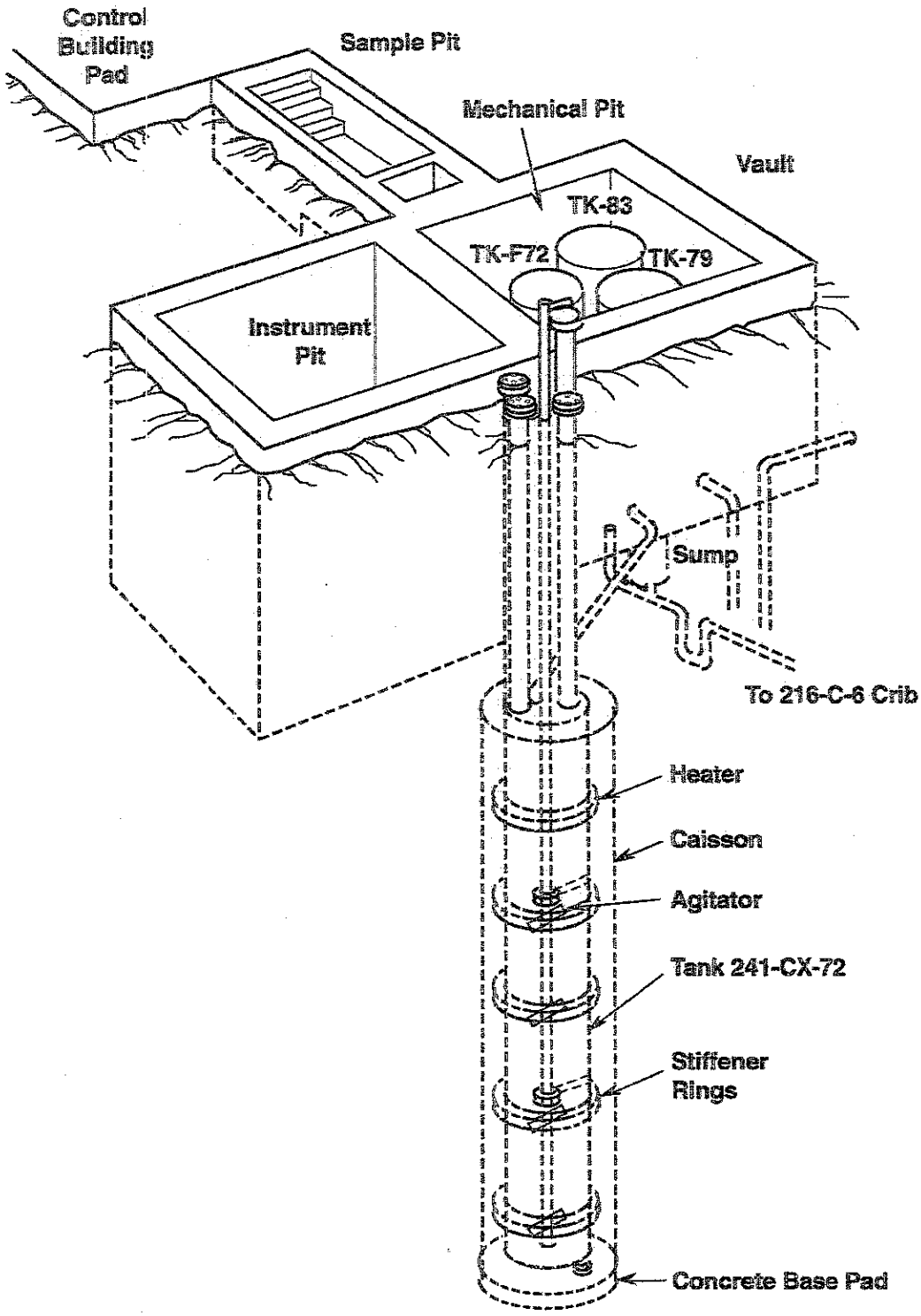
**241-CX TANK SYSTEM**
**TANK 241-CX-72**



46°33'20"
119°31'37"

93060151-1CN
(PHOTO TAKEN 1993)

Figure C-5. Schematic Diagram of 241-CX-72 Storage Tank Layout.



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# C2.0 QUALITY ASSURANCE PROJECT PLAN

The quality assurance project plan (QAPjP) establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. The QAPjP complies with the requirements of the following:

- U.S. Department of Energy (DOE) Directive CRD O 414.1C, *Quality Assurance*
- 10 CFR 830 Subpart A, "Quality Assurance Requirements"
- EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5.

## C2.1 PROJECT MANAGEMENT

This section addresses the basic areas of project management and ensures that the project has a defined goal, that the participants understand the goal and approach to be used, and that the planned outputs have been appropriately documented.

### C2.1.1 Project/Task Organization

The project organization is described in the subsections that follow and is shown in Figure C-6.

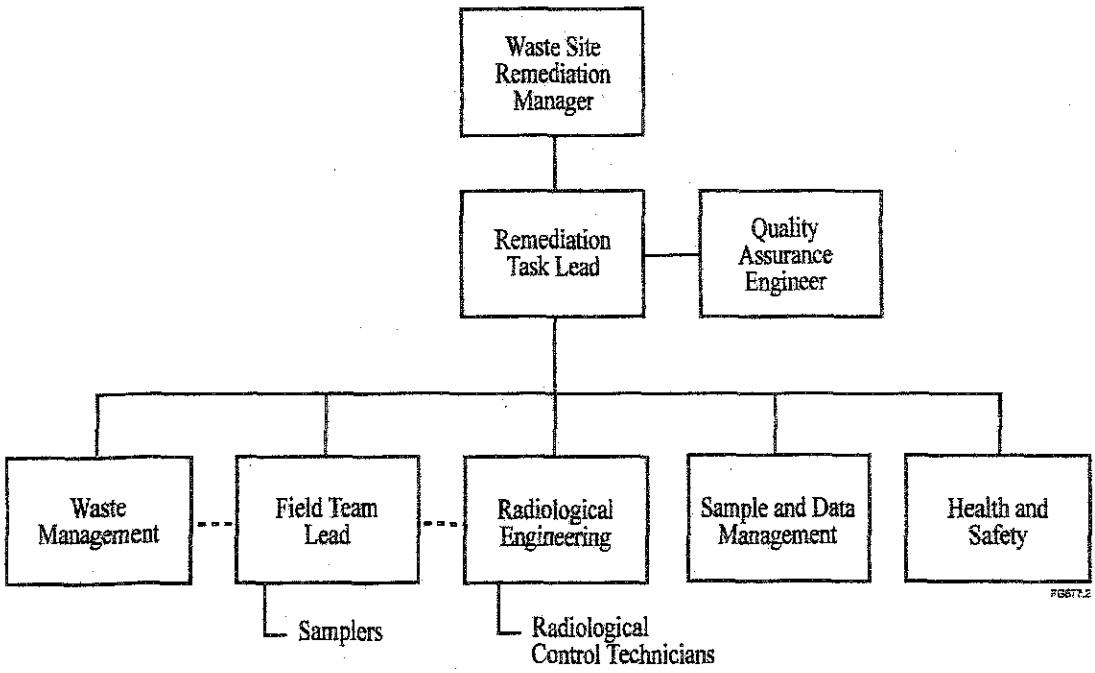
#### C2.1.1.1 Waste Site Remediation Manager

The Waste Site Remediation manager provides oversight for all activities and coordinates with DOE, Richland Operations Office (RL) and regulators in support of sampling activities. In addition, support is provided to the task lead to ensure that the work is performed safely and cost-effectively.

#### C2.1.1.2 Remediation Task Lead

The Remediation task lead is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The task lead ensures that the field team lead, samplers, and others responsible for implementation of this SAP and the QAPjP are provided with current copies of this document and any revisions thereto. The task lead works closely with quality assurance, health and safety, and the field team lead to integrate these and the other lead disciplines in planning and implementing the workscope. The task lead also coordinates with, and reports to, RL, regulators, and the Project Hanford Management Contractor on all sampling activities.

Figure C-6. Project Organization.




### C2.1.1.3 Quality Assurance Engineer

The Quality Assurance engineer is matrixed to the Remediation task lead and is responsible for quality assurance issues on the project. Responsibilities include oversight of implementation of the project quality assurance requirements; review of project documents, including SAPs (and the QAPjP); and participation in quality assurance assessments on sample collection and analysis activities, as appropriate.

### C2.1.1.4 Waste Management

The Waste Management lead communicates policies and procedures and ensures project compliance for storage, transportation, disposal, and waste tracking in a safe and cost-effective manner. Other responsibilities include identifying waste management sampling/characterization requirements to ensure regulatory compliance interpretation (e.g., with WAC 173-303, "Dangerous Waste Regulations") of the characterization data to generate waste designations, profiles, and other documents that confirm compliance with Environmental Restoration Disposal Facility waste acceptance criteria specified in BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria.*

### C2.1.1.5 Field Team Lead

The field team lead has the overall responsibility for the planning, coordination, and execution of the field characterization activities. Specific responsibilities include converting the sampling design requirements into field task instructions that provide specific direction for field activities.

Responsibilities also include directing training, mock-ups, and practice sessions with field personnel to ensure that the sampling design is understood and can be performed as specified. The field team lead communicates with the Remediation task lead to identify field constraints that could affect the sampling design. In addition, the field team lead directs the procurement and installation of materials and equipment needed to support the fieldwork.

The field team lead oversees field-sampling activities that include sample collection, packaging, provision of certified clean sampling bottles/containers, documentation of sampling activities in controlled logbooks, chain-of-custody documentation, and packaging and transportation of samples to the laboratory or shipping center.

The field team leads, samplers, and others responsible for implementation of this SAP and the QAPjP will be provided with current copies of this document and any revisions thereto.

#### C2.1.1.6 Radiological Engineering

The Radiological Engineering lead is responsible for the radiological engineering and health physics support within the project. Specific responsibilities include conducting as-low-as-reasonably-achievable (ALARA) reviews, exposure and release modeling, and radiological controls optimization for all work planning. In addition, radiological hazards are identified and appropriate controls are implemented to maintain worker exposures to the hazards ALARA. Radiological Engineering interfaces with the project safety and health representative and plans and directs radiological control technician support for all activities.

#### C2.1.1.7 Sample and Data Management

The Sample and Data Management organization selects the laboratories that perform the analyses. This organization also ensures that the laboratories conform to Hanford Site internal laboratory quality assurance requirements, or their equivalent, as approved by RL, the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology. The Sample and Data Management organization initiates audits of the laboratories periodically to ensure compliance. Sample and Data Management receives the analytical data from the laboratories, makes the data entry into the *Hanford Environmental Information System* (HEIS) database, and arranges for data validation. Validation will be performed on completed data packages (including quality control [QC] samples) by Fluor Hanford's Environmental Information Services group or by a qualified independent contractor.

#### C2.1.1.8 Health and Safety

Responsibilities include coordination of industrial safety and health support within the project as carried out through safety and health plans, job hazard analyses, and other pertinent safety documents required by Federal regulation or by internal Fluor Hanford work requirements. In addition, assistance is provided to project personnel in complying with applicable health and safety standards and requirements. Personnel protective clothing requirements are coordinated with Radiological Engineering.

### C2.1.2 Background and Problem Definition

The 200-IS-1 OU consists of waste sites that stored or transferred liquid waste containing low to high concentrations of radionuclides and nonradiological constituents. The sites include RCRA TSD units and RCRA past-practice waste sites. Included in the 200-IS-1 Tanks/Lines/Pits/Boxes Waste Group OU is the 241-CX Tank System. Interim closure activities have been completed for these RCRA units.

For the 241-CX-72 Storage Tank, environmental measurements are necessary to support the remedial investigation/feasibility study process and remedial decisions. To meet RCRA closure requirements, the composition of the waste remaining in the tank needs to be determined.

### C2.1.3 Project and Task Description

The field activities described in the SAP include use of borehole drilling and sampling and analysis for evaluation of the waste contents within the 241-CX-72 Storage Tank. A borehole will be drilled through about 25 ft of grout into an approximately 11-ft-thick sludge/waste heel occupying the bottom of the tank. Coring will be conducted to retrieve material from the designated sample intervals. Samples will be analyzed for radiological and nonradiological contaminants of potential concern (COPC). Sampling for analysis of investigative-derived waste (IDW) generated during drilling will be addressed through a waste designation DQO process before the field characterization activities begin.

At the completion of the field investigation, a field report will be prepared to summarize activities performed and information collected in the field. The report will include survey data for the borehole location, the number and types of samples collected and associated HEIS numbers, inventory of IDW containers, geological logs, and field-screening results.

### C2.1.4 Quality Objectives and Criteria for Measurement Data

EPA 600/R-96/055, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, was used to support the development of this SAP. The DQO process is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using the DQO process ensures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application. This section summarizes the key outputs resulting from the implementation of the DQO process.

#### C2.1.4.1 Contaminants of Concern

The DQO process identifies the need to develop a list of COPCs for the 200-IS-1 OU waste sites. Development of the COPCs is an essential step toward refining the preliminary conceptual contaminant distribution models. From an investigation of historical sources including process documents, logbooks, original plant technical manuals, and interviews of plant operators, a preliminary list of potential contaminants was identified. Screening of this list was conducted during the DQO process to arrive at a final list of COPCs for the 200-IS-1 OU. As part of the

assessment and integration of DOE, Office of River Protection (ORP)-owned waste sites into the 200-IS-1 OU work plan, a follow-on DQO effort was conducted in the fall of 2004 and a more comprehensive list of COPCs was developed. Development of this list is summarized in Section 3.6 of DOE/RL-2002-14, Rev. 1, Draft A. The revised list of COPCs is identified in Table C-2. Because of limited documentation and uncertainties associated with some waste stream compositions, routing processes, and disposal actions, this comprehensive COPC list was developed for use at any 200-IS-1 OU waste site. Based on the supplemental DQO process conducted in the fall of 2004, use of this list for the 241-CX Tank System was determined to be appropriate.

Table C-2. CX-241-72 Storage Tank (200-IS-1 Operable Unit) Contaminants of Potential Concern List. (2 Pages)

| CAS Number | Analyte Name | CAS Number | Analyte Name |
|---|---|---|---|
| **Radionuclides** | | | |
| 14596-10-2 | Americium-241 | 13981-16-3 | Plutonium-238 |
| 14234-35-6 | Antimony-125 | 15117-48-3 | Plutonium-239 |
| 14762-75-5 | Carbon-14 | 14119-33-6 | Plutonium-240 |
| 13967-70-9 | Cesium-134 | 13982-63-3 | Radium-226 |
| 10045-97-3 | Cesium-137 | 15262-20-1 | Radium-228 |
| 10198-40-0 | Cobalt-60 | 10098-97-2 | Strontium-90 |
| 14683-23-9 | Europium-152 | 14133-76-7 | Technetium-99 |
| 15585-10-1 | Europium-154 | 7440-29-1 | Thorium-232 |
| 14391-16-3 | Europium-155 | 13968-55-3 | Uranium-233 |
| 10028-17-8 | Hydrogen-3 (tritium) | 13966-29-5 | Uranium-234 |
| 15046-84-1 | Iodine-129 | 15117-96-1 | Uranium-235 |
| 13994-20-2 | Neptunium-237 | 13982-70-2 | Uranium-236 |
| 13981-37-8 | Nickel-63 | 7440-61-1 | Uranium-238 |
| **Inorganics** | | | |
| 7429-90-5 | Aluminum | 7439-96-5 | Manganese |
| 7664-41-7 | Ammonia/ammonium | 7439-97-6 | Mercury (inorganic) |
| 7440-36-0 | Antimony | 7439-98-7 | Molybdenum |
| 7440-38-2 | Arsenic | 7440-02-0 | Nickel |
| 22569-72-8 | Arsenic (III) | 14797-55-8 | Nitrate |
| 17428-41-0 | Arsenic (V) | 14797-65-0 | Nitrite |
| 7440-39-3 | Barium | 14265-44-2 | Phosphate |
| 7440-43-9 | Cadmium | 7782-49-2 | Selenium |
| 16887-00-6 | Chloride | 7440-22-4 | Silver |
| 7440-47-3 | Chromium III | 7440-24-6 | Strontium |
| 18540-29-9 | Chromium (VI) | 14808-79-8 | Sulfate |
| 7440-48-4 | Cobalt | 14265-45-3 | Sulfite |

Table C-2. CX-241-72 Storage Tank (200-IS-1 Operable Unit)
Contaminants of Potential Concern List. (2 Pages)

| CAS Number | Analyte Name | CAS Number | Analyte Name |
|---|---|---|---|
| 7440-50-8 | Copper | 7440-28-0 | Thallium |
| 57-12-5 | Cyanide | 7440-31-5 | Tin |
| 16984-48-8 | Fluoride | 7440-61-1 | Uranium |
| 7553-56-2 | Iodine | 7440-62-2 | Vanadium |
| 7439-92-1 | Lead | 7440-66-6 | Zinc |
| 7439-93-2 | Lithium | | |
| **Organics** | | | |
| 75-34-3 | 1,1-dichloroethane (DCA) | 156-59-2 | Cis-1,2-dichlorothylene |
| 75-35-4 | 1,1-dichloroethene | 53-70-3 | Dibenz[a,h]anthracene |
| 71-55-6 | 1,1,1-trichloroethane (TCA) | 75-09-2 | Dichloromethane (methylene chloride) |
| 79-00-5 | 1,1,2-trichloroethane | 100-41-4 | Ethyl benzene |
| 79-34-5 | 1,1,2,2-tetrachloroethane | 193-39-5 | Indeno[1,2,3-cd]pyrene |
| 95-50-1 | 1,2-dichlorobenzene | 108-10-1 | Methyl isobutyl ketone (MIBK, hexone) |
| 107-06-2 | 1,2-dichloroethane (DCA) | 91-20-3 | Naphthalene |
| 541-73-1 | 1,3-dichlorobenzene | 104-51-8 | n-butyl benzene |
| 121-14-2 | 2,4-dinitrotoluene | 127-18-4 | Tetrachloroethylene (PCE) |
| 78-93-3 | 2-butanone (methyl ethyl ketone/MEK) | 108-88-3 | Toluene |
| 591-78-6 | 2-hexanone | 156-60-5 | Trans-1,2-dichloroethene |
| 71-43-2 | Benzene | 79-01-6 | Trichloroethylene (TCE) |
| 56-55-3 | Benzo[a]anthracene | 1330-20-7 | Xylene |
| 50-32-8 | Benzo[a]pyrene | 68334-30-5 | Total petroleum hydrocarbons (TPH) |
| 205-99-2 | Benzo[b]fluoranthene | 95-48-7 | 2-methylphenol (o-cresol) |
| 207-08-9 | Benzo[k]fluoranthene | 106-44-5 | 4-methylphenol (p-cresol) |
| 71-36-3 | Butanol (n-butyl alcohol) | 112-40-3 | Normal paraffin hydrocarbons |
| 56-23-5 | Carbon tetrachloride | 108-95-2 | Phenol |
| 108-90-7 | Chlorobenzene | 1336-36-3 | Polychlorinated biphenyls (PCBs) |
| 67-66-3 | Chloroform | N/A | Gasoline range organics |
| 218-01-9 | Chrysene | 68334-30-5 | Diesel range organics |

CAS = Chemical Abstracts Service. N/A = not applicable.

If additional analytes not identified as COPCs are detected by the analytical methods used for laboratory analysis, the additional detected analytes and their concentrations will be evaluated against regulatory standards, or risk-based screening levels if exposure data are available, and existing process knowledge. All detected analytes will be reported and included in support of remedial action decision making.

#### C2.1.4.2 Error Tolerance and Decision Consequences

A nonstatistical sampling design was identified as appropriate for this waste site. Using a nonstatistical sampling design, there is no need to define the tolerable limits on decision error because these only apply to statistical designs. Chapters 5.0 and 6.0 of the Work Plan summarize the activities that are planned after the characterization efforts described in this SAP are evaluated.

#### C2.1.4.3 Analytical Quality Objectives

Analytical quality objectives and criteria for laboratory measurement data are presented in Table C-3 for radiological and nonradiological analytes. Analyses of physical properties will be performed according to American Society for Testing and Materials procedures, if applicable.

In the event of a laboratory analytical failure, the laboratory is required to initiate corrective actions with the Sample Data Management team of the Environmental Information Systems group. As part of the data package transmittal procedure, a sample disposition record is generated to define the problem and to indicate the agreed-upon solution reached with discussions by the project manager or task lead. As part of the sample disposition process, quarterly trend reports containing quality statistics are compiled based on the sample disposition records. This provides an insight into emerging problems and the effectiveness of past responses to problems.

#### C2.1.4.4 Laboratory Sample Custody

Sample custody during laboratory analysis will be addressed in the applicable laboratory standard operating procedures. Laboratory custody procedures will ensure the maintenance of sample integrity and identification throughout the analytical process.

### C2.1.5 Quality Assurance Objective

The quality assurance objective of this plan is to develop implementation guidance that will provide data of known and appropriate quality and adhere to the approved Fluor Hanford QAPjP. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. The applicable QC guidelines, quantitative target limits, and levels of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical method. Each of these is addressed in the following subsections.

Table C-3a. Analytical Performance Requirements for Radionuclides.

| COPCs | CAS # | Preliminary Action Levels Used to Determine Analytical Requirements[a] | | | Name/Analytical Technology[c] | Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil/Solids | Accuracy Soil/Solids |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 15 mrem/yr[b] (pCi/g) | 100 mrem/yr[b] (pCi/g) | GW Protection[b] (pCi/g) | | Water Activity (pCi/L) | Soil/ Solids Activity (pCi/g) | | | | |
| **Radionuclides** | | | | | | | | | | | |
| Americium-241 | 14596-10-2 | 335 | 2,240 | N/A | Americium isotopic – AEA | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Antimony-125 | 14234-35-6 | 32.4 | 216 | N/A | GEA | 50 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Carbon-14 | 14762-75-5 | 33,100 | 221,000 | N/A | Chem. separation – liquid scintillation | 15 | 15 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Cesium-134 | 13967-70-9 | 8.43 | 56.2 | N/A | GEA | 15 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Cesium-137 | 10045-97-3 | 23.4 | 156 | N/A | GEA | 15 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Cobalt-60 | 10198-40-0 | 4.90 | 32.7 | N/A | GEA | 25 | 0.05 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Europium-152 | 14683-23-9 | 11.4 | 75.7 | N/A | GEA | 50 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Europium-154 | 15585-10-1 | 10.3 | 68.9 | N/A | GEA | 50 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Europium-155 | 14391-16-3 | 426 | 2,840 | N/A | GEA | 50 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Iodine-129 | 15046-84-1 | 3,081 | 20,500 | 0.024 | Chem. separation – low-energy photon spectroscopy | 5 | 2 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Neptunium-237 | 13994-20-2 | 59.2 | 395 | N/A | Neptunium-237 isotopic – AEA | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Nickel-63 | 13981-37-8 | 4,026 | 20,500,000 | N/A | Chem. separation – liquid scintillation | 15 | 15 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Plutonium-238 | 13981-16-3 | 470 | 3,130 | N/A | Plutonium isotopic – AEA | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Plutonium-239/240 | Pu-239/240 | 425 | 2,840 | N/A | Plutonium isotopic – AEA | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Radium-226 | 13982-63-3 | 7.03 | 46.9 | N/A | Chem. separation – liquid GEA – solid | 1 | 0.1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Radium-228 | 15262-20-1 | 8.15 | 54.3 | N/A | Chem. separation – liquid GEA – solid | 3 | 0.2 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Strontium-90 | Rad-Sr | 2,410 | 16,100 | N/A | Chem. separation – GPC | 2 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Technetium-99 | 14133-76-7 | 412,000 | 2,740,000 | 171 | Chem. separation – liquid scintillation | 15 | 15 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Thorium-232 | 7440-29-1 | 4.8 | 32 | N/A | Thorium isotopic – AEA/ICP/MS | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Tritium (H-3) | 10028-17-8 | 66,900 | 446,000 | 4,100 | Chem. separation – liquid scintillation | 400 | 400 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Uranium-233/234 | 13966-29-5 | 2,660 | 3,280 | 39.5 | Uranium isotopic – AEA/ICP/MS | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Uranium-235/236 | 15117-96-1 | 101 | 67.4 | 3.92 | Uranium isotopic – AEA/ICP/MS | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |
| Uranium-238 | U-238 | 504 | 3,360 | 38.1 | Uranium isotopic – AEA/ICP/MS | 1 | 1 | ±20%(e) | 80-120%(e) | ±35%(e) | 65-135%(e) |

Footnotes, acronyms, and references are cited at the end of Table C-3b.

Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[f] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |
| **Metals** | | | | | | | | | | | |
| Aluminum | 7429-90-5 | 11.800 (i) | 45 | N/A | EPA Method 6010 | 0.05 | 5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Antimony | 7440-36-0 | 1,400 | 5.4 | (k) | EPA Method 6010/200.8 | 0.06 | 0.6 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Arsenic | 7440-38-2 | 87.5 | 20 (l) | 20 (l) | EPA Method 6010/200.8 | 0.1 | 10 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Barium | 7440-39-3 | 245,000 | 923 | 1,320 | EPA Method 6010/200.8 | 0.05 | 2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Cadmium | 7440-43-9 | 139 (m) | 0.81 (n) | 36 | EPA Method 6010/200.8 (trace) | 0.002 | 0.2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Chromium (total) | 7440-47-3 | N/A | 2,000 | 135 | EPA Method 6010/200.8 (trace) | 0.002 | 0.2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Chromium VI | 18540-29-9 | 21 (m) | 7.7 (o) | N/A | EPA Method 7196 – colorimetric | 0.01 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Cobalt | 7440-48-4 | 70,000 (p) | 290 (p) | (k) | EPA Method 6010/200.8 | 0.02 | 2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Copper | 7440-50-8 | 130,000 | 22 (n) | 550 | EPA Method 6010/200.8 | 0.025 | 2.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Lead | 7439-92-1 | 1,000 (q) | 840 (o) | 220 | EPA Method 6010/200.8 | 0.1 | 10 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| | | | | | EPA Method 6010/200.8 (trace) | 0.01 | 1 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Lithium | 7439-93-2 | 70,000 (r) | 1,930 (r) | N/A | EPA Method 6010 | 0.025 | 2.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Manganese | 7439-96-5 | 490,000 | 65.3 | 23,500 | EPA Method 6010/200.8 | 0.005 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Mercury | 7439-97-6 | 1,050 | 0.33 (n) | 9 | EPA Method 7470/200.8 | 0.0005 | N/A | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| | | | | | EPA Method 7471/200.8 | N/A | 0.2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Molybdenum | 7439-98-7 | 17,500 | 32.3 | 71 | EPA Method 6010/200.8 | 0.02 | 2 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Nickel | 7440-02-0 | 70,000 (s) | 130 | 1,850 | EPA Method 6010/200.8 | 0.04 | 4 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Selenium | 7782-49-2 | 17,500 | 5.2 | 0.8 | EPA Method 6010/200.8 | 0.1 | 1 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Silver | 7440-22-4 | 17,500 | 0.88 (t) | (k) | EPA Method 6010/200.8 (trace) | 0.005 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Strontium | 7440-24-6 | 2,100,000 | 2,920 | N/A | EPA Method 6010/200.8 | 0.01 | 1 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Thallium | 7440-28-0 | 245 | 1.59 | N/A | EPA Method 6010/200.8 | 0.05 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Tin | 7440-31-5 | 2,100,000 | 25,000 | (k) | EPA Method 6010/200.8 | 0.1 | 10 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Uranium (total) | 7440-61-1 | 1,050 | 1.32 | N/A | Uranium total – kinetic phosphorescence analysis/EPA Method 200.8 | 0.0001 | 0.001 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Vanadium | 7440-62-2 | 24,500 | 2,240 | (k) | EPA Method 6010/200.8 | 0.025 | 2.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Zinc | 7440-66-6 | 1,050,000 | 5,970 | 570 | EPA Method 6010/200.8 | 1.01 | 1 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |

Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[f] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |
| **Inorganics** | | | | | | | | | | | |
| Ammonia/ ammonium | 7664-41-7 | N/A | N/A | N/A | EPA Method 350/300.7 | 0.05 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Chloride | 16887-00-6 | N/A | 1,000 | N/A | EPA Method 300.0 | 0.5 | 5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Cyanide | 57-12-5 | 70,000 | 0.80 | N/A | Total cyanide – EPA Method 9010 – colorimetric | 0.005 | 0.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Fluoride | 16984-48-8 | 210,000 | 24.1 | N/A | EPA Method 300.0 | 0.5 | 5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Iodine | 7553-56-2 | N/A | N/A | N/A | EPA Method 345.1 | 2 | 20 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Nitrate | 14797-55-8 | 5,600,000 | 40 | N/A | EPA Method 300.0 | 0.25 | 2.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Nitrite | 14797-65-0 | 350,000 | 4 | N/A | EPA Method 300.0 | 0.25 | 2.5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Phosphate | 14265-44-2 | N/A | N/A | N/A | EPA Method 300.0 | 0.5 | 5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Sulfate | 14808-79-8 | N/A | 1,030 | N/A | EPA Method 300.0 | 0.5 | 5 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| Sulfite | 14265-45-3 | N/A | N/A | N/A | EPA Method 377.1 | 2 | 20 | ±20%(j) | 80-120%(j) | ±35%(j) | 65-135%(j) |
| **Organics** | | | | | | | | | | | |
| 1,1-dichloroethylene | 75-35-4 | 219 | 4.37 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 1,1,2-trichloroethane | 79-00-5 | 2,3000 | 0.00427 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 1,1,2,2-tetrachloroethane | 79-34-5 | 656 | 0.00123 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 1,2-dichlorobenzene | 95-50-1 | 315,000 | 7.03 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 1,3-dichlorobenzene | 541-73-1 | 105,000) (v) | 3.09 (v) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 2,4-dinitrotoluene | 121-14-2 | 7,000 | 0.189 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 2-hexanone | 591-78-6 | 140,000 (w) | 2.73 (w) | N/A | EPA Method 8260/5035A | 0.01 | 0.01 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Benzene | 71-43-2 | 2,390 | 0.00448 | N/A | EPA Method 8260/5035A | 0.005 | 0.0015 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Benzo[a]anthracene | 56-55-3 | 180 (p) | 0.856 (p) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Benzo[a]pyrene | 50-32-8 | 18 (x) | 0.232 (x) | 300 | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Benzo[b]fluoranthene | 205-99-0 | 180 (p) | 2.95 (p) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Benzo[k]fluoranthene | 207-08-9 | 1,800 (p) | 29.5 (p) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| n-butyl alcohol | 71-36-3 | 350,000 | 6.62 | N/A | EPA Method 8015 | 5 | 5 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Carbon tetrachloride | 56-23-5 | 1,010 | 0.0031 | N/A | EPA Method 8260/5035A | 0.005 | 0.0015 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Chlorobenzene | 108-90-7 | 70,000 | 0.874 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |

Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[f] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |
| Chloroform | 67-66-3 | 21,500 | 0.0381 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Chrysene | 218-01-9 | 18,000 (p) | 95.6 (p) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Butyl benzene; n | 104-51-8 | 240 (y) | 110 (y) | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Dibenz[a,h]anthracene | 53-70-3 | 18 | 0.429 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Dichloroethane; 1,1 | 75-34-3 | 350,000 | 4.37 | N/A | EPA Method 8260/5035A | 0.01 | 0.01 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Dichloroethane; 1,2 | 107-06-2 | 1,440 | 0.00232 | N/A | EPA Method 8260/5035A | 0.005 | 0.0015 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Dichloroethylene; 1,2- (trans) | 156-60-5 | 31,500 (z) | 0.36 (t) | N/A | EPA Method 8260/5035A | 0.001 | 0.001 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Dichloroethylene; 1,2-cis- | 156-59-2 | 31,500 (z) | 0.36 (t) | N/A | EPA Method 8260/5035A | 0.001 | 0.001 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Ethylbenzene | 100-41-4 | 350,000 | 6.05 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 180 (p) | 8.33 (p) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Methyl ethyl ketone (MEK; 2-butanone) | 78-93-3 | 2,100,000 | 19.6 | N/A | EPA Method 8260/5035A | 0.01 | 0.01 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Naphthalene | 91-20-3 | 14,000 (aa) | 2.03 (aa) | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Methyl isobutyl ketone (MIBK hexone) | 108-10-1 | 280,000 | 2.71 | N/A | EPA Method 8260/5035A | 0.01 | 0.01 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Methylene chloride (dichloromethane) | 75-09-2 | 17,500 | 0.0254 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Polychlorinated biphenyls | 1336-36-3 | 10 (q) | 0.0021 (bb) | 2 | EPA Method 8082 | 0.0005 | 0.0165 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Tetrachloroethylene | 127-18-4 | 2,570 | 0.0091 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Toluene | 108-88-3 | 70,000 | 7.27 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Trichlorethane; 1,1,1 | 71-55-6 | 3,150,000 | 1.58 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Trichloroethylene | 79-01-6 | 11,900 | 0.0263 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Xylene (total) | 1330-20-7 | 700,000 | 14.6 | N/A | EPA Method 8260/5035A | 0.005 | 0.005 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Total petroleum hydrocarbons – diesel to oil range (kerosene) | 68334-30-5 | 2,000 (q) | 2,000 (q) | 15,000 | WTPH-D/Analytical Methods for Petroleum Hydrocarbons (Ecology 97-602) | 0.5 | 5 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Oil and Grease | 8008-20-6 | 2,000 | 2,000 | N/A | EPA 413.N | 2 | 200 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| 2-methylphenol (o-cresol) | 95-48-7 | 175,000 | 10.3 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |

Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[f] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |
| 4-methylphenol (p-cresol) | 106-44-5 | 17,500 | 1.01 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Total petroleum hydrocarbons – (gasoline range) | 8006-61-9 | 30 (q) | 30 (q) | 12,000 | WTPH-G/Analytical Methods for Petroleum Hydrocarbons (Ecology 97-602) | 0.5 | 5 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Normal paraffin hydrocarbons (n-dodecane) | 112-40-3 | 2,000 (q) | 2,000 (q) | 15,000 | Nonhalogenated VOA - EPA Method 8015M – gas chromatography modified for hydrocarbons | 0.5 | 5 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| Phenol | 108-95-2 | 1,050,000 | 22 | N/A | EPA Method 8270 | 0.01 | 0.330 | ±20%(u) | 50-150%(u) | ±35%(u) | 50-150%(u) |
| **Physical Properties** | | | | | | | | | | | |
| Alkalinity | N/A | N/A | N/A | N/A | EPA Method 310 | N/A | TBD | N/A | N/A | ±35%(j) | 65-135%(j) |
| Gross alpha | 14127-62-9 | N/A | N/A | N/A | GPC | N/A | TBD | N/A | N/A | N/A | N/A |
| Gross beta | 12587-47-2 | N/A | N/A | N/A | GPC | N/A | TBD | N/A | N/A | N/A | N/A |
| Gross gamma | N/A | N/A | N/A | N/A | NaI or germanium detectors in scan mode | N/A | TBD | N/A | N/A | N/A | N/A |
| Moisture content | N/A | N/A | N/A | N/A | ASTM D2216 | N/A | wt% | N/A | N/A | N/A | N/A |
| pH | N/A | N/A | N/A | N/A | EPA Method 150/9045 | 0.1 unit | 0.1 unit | N/A | N/A | N/A | N/A |
| Bulk Density | N/A | N/A | N/A | N/A | ASTM D2937 | N/A | wt% | N/A | N/A | N/A | N/A |
| Particle size distribution | N/A | N/A | N/A | N/A | ASTM D422 | N/A | wt% | N/A | N/A | N/A | N/A |

[a]The preliminary action level is the regulatory- or risk-based value used to determine appropriate analytical requirements (e.g., detection limits). Remedial action levels will be proposed in the feasibility study, will be finalized in the record of decision, and will drive remediation of the sites.

[b]15 mrem/yr = nonrad worker industrial exposure scenario; 2,000 h/yr onsite, 60% indoors, 40% outdoors. 100 mrem/yr = rad-worker industrial scenario; 2,000 h/yr onsite, 60% indoors, 40% outdoors. GW = groundwater protection radionuclide values based on RESRAD modeling of drinking water exposure with the entire vadose zone presumed to be contaminated. Groundwater protection may be evaluated using the STOMP code or another model to predict movement of contaminants through the vadose zone.

[c]All four-digit numbers refer to SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-B.*

[d]Water values for sampling quality control (e.g., equipment blanks/rinses) or drainable liquid (if recovered). For water and soil media, matrix affects may have an impact on a specific sample basis.

[e]Accuracy criteria for associated batch laboratory control sample percent recoveries. Except for GEA, additional analysis-specific evaluations also preformed for matrix spikes, tracers, and carriers as appropriate to the method. Precision criteria for batch laboratory replicate sample analyses.

[f]WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties," Method C industrial soil values for direct exposure from the CLARC Version 3.1 tables, updated November 2001.

[g]WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," soil concentrations protective of groundwater based on Method B values for groundwater from the CLARC Version 3.1 tables, updated August 2001, except as noted.

[h]Value is from Table 749-2 of WAC 173-340-900, "Tables," amended February 12, 2001.

[i]Hanford Site background concentration for soil.

[j]Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples also performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analysis.

## Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[e] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |

[k]According to Footnote d of Table 749-2, Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure, referenced in WAC 173-340-7492, "Simplified Terrestrial Ecological Evaluation Procedures," safe concentration has not yet been established for these constituents. See WAC 173-340-7492 (2)(c).
[l]Statewide background value for arsenic.
[m]Calculated using air cleanup standards from WAC 173-340-750(3)(a)(ii)(B), page 210, equation 750-2, with Washington State Department of Health mass loading of particulates in air of $10^{-4}$ g/m$^2$.
[n]Value is less than Hanford Site soil background. Therefore, the soil background concentration is used as the preliminary action level.
[o]Calculated using standards for surface water protection (40 CFR 131 and WAC 173-201A-040) as inputs to the three-phase model for protection of drinking water [WAC 173-340-747(4), February 12, 2001].
[p]Calculated using RfD from Oak Ridge National Laboratory, July 14, 2004.
[q]Based on WAC 173-340-900, Tables 740-1 and 745-1, amended February 12, 2001.
[r]Based on reference dose from Region 3; NCEA.
[s]Based on soluble salts value.
[t]Calculated using WAC 173-340-720 drinking water standards as inputs to the three-phase model for protection of drinking water [WAC 173-340-747(4), amended February 12, 2001], except as noted.
[u]Accuracy criteria is the minimum for associated batch laboratory control sample percent recoveries. Laboratories must meet statistically based control if more stringent. Additional analyte-specific evaluations also preformed for matrix spikes, and surrogates as appropriate to the method. Precision criteria for batch laboratory replicate matrix spike analyses.
[v]Calculated using RfD from Region 3.
[w]Calculated from EPA Region 3 toxicity values; NCEA.
[x]Values are from the *Integrated Risk Information System* database.
[y]WAC 173-340-747(4) fixed-parameter three-phase partitioning model equation value for soil protection of groundwater calculated using drinking water standards from EPA Region 9.
[z]Values reported for mixed isomers rather than cis/trans-1,2-dichloroethylene because both are present and the mixed isomers value is more protective.
[aa]Calculated from Rfd in the *Integrated Risk Information System* database, which first appeared December 22, 2003.
[bb]Based on soil concentration that is protective of the river.


40 CFR 131, "Water Quality Standards."
ASTM, *1993 Annual Book of ASTM Standards*, Volume 04.08.
Ecology 94-145, *Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation; CLARC, Version 3.1.*
Ecology 97-602, 1997, *Analytical Methods for Petroleum Hydrocarbons.*
*Integrated Risk Information System* database (EPA 2003).
PNNL-11216, *STOMP -- Subsurface Transport Over Multiple Phases: Application Guide.*
SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-B.*
WAC 173-201A-040, "Water Quality Standards for Surface Waters of the State of Washington," "Toxic Substances."
WAC 173-340, "Model Toxics Control Act -- Cleanup."
WAC 173-340-720, "Ground Water Cleanup Standards."
WAC 173 340 750(3)(b)(ii)(B), "Cleanup Standards to Protect Air Quality," "Method B Air Cleanup Levels," "Applicability," "Human Health Protection," "Carcinogens."

For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1.*
For EPA Method 300.7, see EPA/600/4-86/024, *Development of Standard Methods for the Collection and Analysis of Precipitation.*
For EPA Methods 150.1, 300.0, 310, 345.1, 377.1, and 413.N, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes.*

Table C-3b. Analytical Performance Requirements for Nonradionuclides. (6 Pages)

| COPCs | CAS # | Preliminary Action Level[a] | | | Name/Analytical Technology[c] | Required Target Quantitation Limits[d] | | Precision Water | Accuracy Water | Precision Soil | Accuracy Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WAC 173-340-745 Method C[f] (mg/kg) | GW Protection[g] (mg/kg) | Terrestrial Biota Protection[h] (mg/kg) | | Water Conc. (mg/L) | Soil Conc. (mg/kg) | | | | |

AEA = alpha energy analysis.
ASTM = American Society for Testing and Materials.
CAS = Chemical Abstracts Service.
CLARC = *Cleanup Levels and Risk Calculations under the Model Toxics Control Act Regulation* (CLARC Version 3.1) (Ecology 94-145).
COPC = contaminant of potential concern.
CVAA = cold vapor atomic absorption.
EPA = U.S. Environmental Protection Agency.
GEA = gamma energy analysis.
GPC = gas proportional counting.
GW = groundwater.
ICP/MS = inductively coupled plasma/mass spectrometry.
N/A = not applicable.
NaI = sodium iodide.
NCEA = National Center for Environmental Assessment.
RESRAD = RESidual RADioactivity (dose model).
RfD = reference dose.
STOMP = Subsurface Transport Over Multiple Phases (code) (PNNL-11216).
TBD = to be determined.
VOA = volatile organic analyte.
WAC = *Washington Administrative Code*.
WTPH-D = Washington state total petroleum hydrocarbons – diesel range.
WTPH-G = Washington state total petroleum hydrocarbons – gasoline range.

#### C2.1.5.1 Representativeness

Representativeness is a measure of how closely the results reflect the actual concentration and distribution of the chemical and radiological constituents in the matrix sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, transportation) have been developed and are discussed in subsequent sections of this document. The documentation will establish that protocols have been followed and that sample identification and integrity are ensured.

#### C2.1.5.2 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using standard procedures and consistent methods and units. Table C-3 lists applicable fixed-laboratory methods for analytes and target detection limits. Actual detection limits will depend on the sample matrix and the sample quantity available. Data will be reported as defined for specific samples.

#### C2.1.5.3 Accuracy

Accuracy is an assessment of the closeness of the measured value to the true value. Accuracy of chemical test results is assessed by spiking samples with known standards and establishing the average recovery. A matrix spike is the addition to a sample of a known amount of a standard compound similar to the compounds being measured. Radionuclide measurements that require chemical separations use this technique to measure method performance. For radionuclide measurements that are analyzed by gamma spectroscopy, laboratories typically compare results of blind audit samples against known standards to establish accuracy. Validity of calibrations is evaluated by comparing results from the measurement of a standard to known values and/or by generation of in-house statistical limits based on three standard deviations (+/- 3 SD). Table C-3 lists the accuracy provided for fixed-laboratory analyses for the project.

#### C2.1.5.4 Precision

Precision is a measure of the data spread when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference for duplicate measurements or relative standard deviation for triplicates. Table C-3 lists the analytical precision for fixed-laboratory analyses.

#### C2.1.5.5 Completeness

A target value for data completeness was not defined in the DQO process; therefore, no requirement applies to this SAP.

#### C2.1.5.6 Detection Limits

Detection limits are functions of the analytical method used to provide the data and the quantity of the sample available for analyses. Method detection limits for the COPC are presented in Table C-3.

### C2.1.6 Special Training Requirements/Certification

Typical training or certification requirements have been instituted by the Project Hanford Management Contractor team to meet training requirements imposed by the Project Hanford Management Contract (DE-AC06-96RL13200, *Contract Between the U.S. Department of Energy, Richland Operations Office, and Fluor Daniel Hanford, Inc.*), regulations, DOE orders, contractor requirements documents, American National Standards Institute/American Society of Mechanical Engineers standards, *Washington Administrative Code*, etc. For example, training or certification requirements needed by sampling personnel will be in accordance with Site analytical quality requirements.

The environmental safety and health training program provides workers with the knowledge and skills necessary to safely execute assigned duties. Field personnel typically will have completed the following training before starting work:

- Occupational Safety and Health Administration 40-hour hazardous waste worker training and supervised 24-hour hazardous waste-site experience
- 8-hour hazardous waste worker refresher training (as required)
- Hanford general employee radiation training
- Radiological worker training.

A graded approach is used to ensure that workers receive a level of training commensurate with their responsibilities that complies with applicable DOE orders and government regulations. Specialized employee training includes prejob briefings, on-the-job training, emergency preparedness, plan-of-the-day activities, and facility/worksite orientations.

### C2.1.7 Documents and Records

Planning for sample collection and analysis shall be in accordance with the programmatic requirements governing fixed-laboratory sample collection activities as discussed in the sample teams' procedures. In the event that specific procedures do not exist for a particular work evolution, or if it is determined that additional guidance to complete certain tasks is needed, a work package will be developed to adequately control the activities, as appropriate. Examples of the sample teams' requirements include the activities associated with the following:

- Chain-of-custody/sample analysis requests
- Project and sample identification for sampling services
- Control of certificates of analysis
- Logbooks, checklists
- Sample packaging and shipping.

Approved work control packages and procedures will be used to document radiological measurements when implementing this SAP. Examples of the types of documentation for field radiological data include the following:

- Instructions regarding the minimum requirements for documenting radiological controls information as discussed in 10 CFR 835, "Occupational Radiation Protection"
- Instructions for managing the identification, creation, review, approval, storage, transfer, and retrieval of Hanford Site radiological records
- The minimum standards and practices necessary for preparing, performing, and retaining radiological-related records
- The indoctrination of personnel on the development and implementation of survey/sample plans
- The requirements associated with preparing and transporting regulated material.

## C2.2 DATA GENERATION AND ACQUISITION

### C2.2.1 Sample Process Design

A nonstatistical sampling design (professional judgment) was used to determine sample locations for this waste site. A biased (or focused) sampling approach was selected based on process knowledge and expected behavior of COPCs. The total number of samples selected for analysis was based on acquiring sufficient data to assess the vertical profile of the waste and to determine if any stratification and heterogeneity occurred within the waste present in the tank.

For this below-ground RCRA storage tank, the purpose of this investigation is to determine the composition and concentrations of the remaining hazardous and/or radioactive COPCs within the tank.

The field-sampling plan for the characterization effort is presented in Chapter C3.0 of this SAP. Chapter C3.0 presents information on sampling objectives and methodologies. Changes to the workscope detailed in the SAP may be required because of unexpected field conditions, new information, health and safety concerns, or other anomalies. Minor changes that have no adverse effect on the DQOs or project schedule can be made in the field with the approval of the project manager or assigned task lead and then documented in the daily field logbook and/or field summary reports. Changes that affect the DQOs will require concurrence by RL and the lead regulatory agency and can be documented through unit managers' meetings. Alternatively, if substantial changes are required, this SAP can be revised and reissued, requiring RL and regulator approval.

## C2.2.2 Sampling Methods

### C2.2.2.1 Investigative Techniques

Field-screening measurements, in addition to the collection of samples for laboratory analysis, will be used to determine occurrence of COPCs.

### C2.2.2.2 Field-Screening Analyses

The applicable field-screening methods and performance requirements are presented in Table C-4. Special care should be taken to prevent cross-contamination of field-screening equipment by properly storing and handling the equipment and performing proper decontamination between sampling events.

Table C-4. Field-Screening Methods.

| Measurement Type | Emission Type | Method/Instrument | Detection Limit |
|---|---|---|---|
| Exposure/dose rate | Beta/gamma | RO-20/RO-03 portable ionization chamber | 0.5 mrem/h |
| Contamination level | Alpha | 100 $cm^2$ portable alpha meter or equivalent instrument | 90 d/min $\alpha$/100 $cm^2$ (10 sec static count)<br>250 d/min $\alpha$/100 $cm^2$ (1 in/sec scan speed) |
| Contamination level | Beta/gamma | 100 $cm^2$ ruggedized scintillation detector or equivalent | 500 d/min $\beta$–$\gamma$/100 $cm^2$ (20 sec static count @ 13% efficiency)<br>1,400 d/min $\beta$–$\gamma$/100 $cm^2$ (2 in/sec scan speed) |
| Contamination level | Gamma | 2- by 2-in. NaI detector (e.g., Ludlum 44-3 or equivalent) | 3 pCi/g Cs-137 in soils |
| Contamination level | Gamma | 2 in. by 10 mm NaI low-energy gamma detector (e.g., Eberline PG-2 or equivalent) | 20 pCi/g Am-241 in soils |
| Vapor screening | Volatile organic compounds | Handheld photo ionization detector | ~1 $ppm_v$ (common field photo ionization detector instruments can indicate down to 1 $ppm_v$ or less) |

Eberline E-600 and SHP380-A/B are trademarks of Eberline Instruments, a subsidiary of Thermo Electron Corporation, Waltham, Massachusetts.
Ludlum is a trademark of Ludlum Measurements, Inc., Sweetwater, Texas.
RO-20 and RO-03 are trademarks of Eberline Instruments, a subsidiary of Thermo Electron Corporation, Waltham Massachusetts.

d/min = disintegrations per minute.
$ppm_v$ = parts per million volume.

### C2.2.2.3 Radiological Field Data

Alpha and beta/gamma field data will be used to support the characterization described in this SAP, as appropriate. The following information will be disseminated to personnel performing work in support of this SAP, as appropriate:

- Instructions to the radiological control technicians on methods required to measure sample activity and media for gamma, alpha, and/or beta emissions, as appropriate. This will include direction to allow the radiological control technicians to calculate a number of quantities supporting sample analysis.

- Information regarding the Geiger-Mueller[1] portable instrument, to include a physical description of the Geiger-Mueller instrument, radiation and energy response characteristics, calibration/maintenance and performance testing descriptions, and the application/operation of the instrument. The Geiger-Mueller instrument is a commonly used beta/gamma instrument on the Hanford Site when removable surface contamination measurements and direct measurements of the total surface contamination are performed.

- Information regarding the portable alpha meter, to include a physical description of the portable alpha meter, radiation and energy response characteristics, calibration/ maintenance and performance testing descriptions, and the application/operation of the instrument. The portable alpha meter instrument is a commonly used alpha instrument on the Hanford Site when removable surface contamination measurements and direct measurements of the total surface contamination are performed.

- Information regarding the sodium iodide detector, to include a physical description of the sodium iodide detector, radiation and energy response characteristics, calibration/ maintenance and performance testing descriptions, and the application/operation of the instrument. The sodium iodide detector instrument is a commonly used gamma detector on the Hanford Site when direct measurements are performed.

- Information on the characteristics associated with the hand-held probes to be used in the performance of direct radiological measurements. The information includes a physical description of the probe, the radiation and energy response characteristics, calibration/maintenance and performance testing descriptions, and the application/operation of the instrument. Probes appropriate for the type and energy range of radioactivity present are commonly used on the Hanford Site when removable surface contamination measurements and direct measurements of the total surface contamination are performed.

### C2.2.2.4 Sample Location

The borehole location will be identified in the field before starting the activity. The location will be marked by the technical lead or field team lead assigned by the project manager. After the

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[1] Geiger-Mueller is not a trademark.

location has been marked, minor adjustments to the location may be made to mitigate unsafe conditions and avoid structural interferences. Sample location identification numbers will be defined during or after sampling. Changes in sample locations that do not affect the DQOs will require approval of the task lead. Changes to sample locations that result in impacts to the DQOs will require concurrence by RL and the lead regulatory agency.

Surface radiation surveys will be conducted at the borehole location. The surface radiation surveys will identify areas of surface contamination that might affect the field activities and health and safety.

#### C2.2.2.5 Summary of Sampling Activities

Table C-5 summarizes the number and types of characterization and field quality control samples to be collected at the 241-CX-72 Storage tank.

Table C-5. Summary of Projected Sample Collection Requirements.

| Sampling Method | 241-CX-72 Storage Tank |
|---|---|
| Boreholes for Samples Collection | 1 |
| **Samples for Radiological and Nonradiological Contaminants of Potential Concern** | |
| Core samples | 4 |
| **Quality Control Samples** | |
| Duplicates | 1 |
| Splits | 1 |
| Equipment blanks | 1 |
| Field blank | 1 |
| **Total number of quality control samples** | 4 |

### C2.2.3 Field Sample Handling and Custody

#### C2.2.3.1 Sample Identification

The *Sample Data Tracking* database will be used to track the samples from the point of collection through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. The HEIS sample numbers will be issued to the sampling organization for this project in accordance with onsite organizational procedures. Each radiological/nonradiological and physical properties sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information using a waterproof marker on firmly affixed water-resistant labels:

- Sampling Authorization Form
- HEIS number

- Sample collection date and time
- Name or initials of person collecting the sample
- Analysis required
- Preservation method (if applicable).

#### C2.2.3.2 Field Sampling Logbook

All information pertinent to field sampling and analysis will be recorded in field checklists and bound logbooks in accordance with existing sample collection protocols. The sampling team will be responsible for recording all relevant sampling information. Entries made in the logbook will be dated and signed by the individual who made the entry. Program requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of records within the Project Hanford Management Contractor will be followed.

#### C2.2.3.3 Sample Custody

Sample custody will be maintained in accordance with existing Hanford Site protocols. The custody of samples will be maintained from the time the samples are collected until the ultimate disposal of the samples, as appropriate. A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to any laboratory. Samples will be sent to the laboratory in accordance with applicable shipping procedures. The analyses requested for each sample will be indicated on the accompanying Chain-of-Custody Form. Custody tape will be used to provide indication of tampering with the samples. The custody tape will be inscribed with the sampler's initials and the date. Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time the responsibility changes for the custody of the sample, the new and previous custodians will sign the record and note the date and time. The shipper will make a copy of the signed record before sample shipment and will transmit the copy to Sample and Data Management within 48 hours of shipping.

#### C2.2.3.4 Sample Containers and Preservatives

Level I EPA pre-cleaned sample containers will be used for samples collected for chemical and radiological analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits. If, however, the dose rate on the outside of a sample jar or the curie content within the sample exceeds levels acceptable by a laboratory, smaller volumes may be sent to the laboratory after consultation with Sample and Data Management to determine acceptable volumes. Sample preservation, containers, and holding times for radiological and nonradiological analytes in are shown in Table C-6.

Table C-6. Sample Preservation, Container, and Holding Time Guidelines and Analytical Priorities. (2 Pages)

| Analytes | Analytical Priority[c] | Matrix | Bottle | | Amount[a,b,c] | Preservation | Packing Requirements | Holding Time |
|---|---|---|---|---|---|---|---|---|
| | | | Number | Type | | | | |
| **Radionuclides** | | | | | | | | |
| Americium-241 | 10 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Cesium-137 | 1 | Soil/Solids | 1 | G/P | 100 to 1,500 g | None | None | 6 months |
| Cobalt-60 | 1 | Soil/Solids | | | | | | |
| Europium-152 | 1 | Soil/Solids | | | | | | |
| Europium-154 | 1 | Soil/Solids | | | | | | |
| Europium-155 | 1 | Soil/Solids | | | | | | |
| Iodine-129 | 12 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Plutonium-238 | 1 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Plutonium-239/240 | 1 | Soil/Solids | | | | | | |
| Strontium-90 | 1 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Technetium-99 | 8 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Tritium (H-3) | 12 | Soil/Solids | 1 | G | 100 to 500 g | None | None | 6 months |
| Uranium-233/234 | 1 | Soil/Solids | 1 | G/P | 10 to 1,000 g | None | None | 6 months |
| Uranium-235/236 | 1 | Soil/Solids | | | | | | |
| Uranium-238 | 1 | Soil/Solids | | | | | | |
| **Chemicals** | | | | | | | | |
| Ammonia/ ammonium – 350.1 | 3 | Soil/Solids | 1 | G/P | 50 to 500 g | None | Cool 4 °C | 28 days |
| IC anions – 300.0 | 3 | Soil/Solids | 1 | G/P | 50 to 500 g | None | Cool 4 °C | 28 days/ 48 hours |
| IC anions – 353.1 for nitrate/nitrite | 3 | Soil/Solids | 1 | G/P | 50 to 500 g | None | Cool 4 °C | 28 days/ 48 hours |
| ICP metals – 6010A | 2 | Soil/Solids | 1 | G/P | 10 to 500 g | None | None | 6 months |
| Chromium hex – 7196 | 4 | Soil/Solids | 1 | G/P | 5 to 500 g | None | Cool 4 °C | 30 days |
| Mercury – 7471 – (CVAA) | 5 | Soil/Solids | 1 | G | 5 to 125 g | None | None | 28 days |
| Total cyanide – 9010 | 11 | Soil/Solids | 1 | G | 10 to 1,000 g | None | Cool 4 °C | 14 days |
| pH (solid) – 9045 | 13 | Soil/Solids | 1 | G/P | 10 to 250 g | None | None | Within 24 hrs of lab receipt |
| Semivolatile organic analyte – 8270A | 6 | Soil/Solids | 1 | AG | 125 to 1,000 g | None | Cool 4 °C | 14/40 days |
| VOA – 8260/5035A | 7 | Soil/Solids | 9 | AG | 5 g each bottle | Methanol in 4 bottles and frozen -7 °C to -20 °C (sample) in 5 bottles | Cool 4 °C | 14 days |

Table C-6. Sample Preservation, Container, and Holding Time Guidelines and Analytical Priorities. (2 Pages)

| Analytes | Analytical Priority[e] | Matrix | Bottle | | Amount[a,b,c] | Preservation | Packing Requirements | Holding Time |
|---|---|---|---|---|---|---|---|---|
| | | | Number | Type | | | | |
| Nonhalogenated VOA – 8015M – gas chromatography modified for normal paraffin hydrocarbon | 9 | Soil/Solids | 1 | AG | 125 to 250 g | None | Cool 4 °C | 14 days |
| WTPH-D | 11 | Soil/Solids | 1 | G | 50 to 150 g | None | Cool 4 °C | 14 days |
| WTPH-G | 11 | Soil/Solids | 1 | G | 50 to 150 g | None | Cool 4 °C | 14 days |
| Oil and grease | 12 | Soil/Solids | 1 | G | 200 g | None | Cool 4 °C | 28 days |
| Polychlorinated biphenyls – EPA Method 8082 | 10 | Soil/Solids | 1 | G | 10 to 50g | None | Cool 4 °C | 14 days |
| **Physical Properties** | | | | | | | | |
| Bulk density – ASTM D2937 | 14 | Soil/Solids | 1 | Liner | Liner | None | None | None established for analysis |
| Moisture content – ASTM D2216 | 15 | Soil/Solids | 1 | Moisture tin[d] | 250 g | None | None | As soon as practicable |
| Particle size distribution – ASTM D422 | 16 | Soil/Solids | 1 | G/P | 100 to 4,000 g | None | None | None established for analysis |

[a]Optimal volumes, which may be adjusted downward to accommodate the possibility of retrieval of small amount of sample. Minimum sample size will be defined on the Sampling Authorization Form.

[b]Should samples be liquid rather than soils, the following volumes need to be collected:

Radionuclides – 4 L for all radionuclides (except C-14, tritium, and Tc-99, which require approximately 500 mL for each sample).

Chemicals – All liquid samples require the amount as listed for soil samples. Preservation and holding times also are affected if liquid samples are collected. Consult Sample Management staff for details.

[c]Mixed soil samples may be obtained and submitted to the analytical laboratory for analyses for specific analytes, including the following:

Radionuclides – 100 g of soil for all radionuclides (except C-14, tritium, and Tc-99, which require approximately 10 g for each sample).

Chemicals – A 10 g soil sample is required for all ICP analyses, 10 g soil sample is required for IC anion analysis, 5 g soil sample for hexavalent chromium analysis, 10 g soil sample for 9010 analysis, 10 g soil sample for 8015 analysis, and 125 g soil samples for each 8270 and total organic carbon analysis.

[d]Vessel must be sealed.

[e]Analytical priority may be adjusted.

ASTM, *1993 Annual Book of ASTM Standards*, Volume 04.08.

For 4-digit methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-B*.

For EPA Methods 300.0, 350.1, and 353.1, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*.

AG = amber glass.
ASTM = American Society for Testing and Materials.
CVAA = cold vapor atomic absorption.
EPA = U.S. Environmental Protection Agency.
G = glass.
IC = ion chromatography.
ICP = inductively coupled plasma.
WTPH-D = Washington state total petroleum hydrocarbons – diesel range.
WTPH-G = Washington state total petroleum hydrocarbons – gasoline range.
P = plastic.
VOA = volatile organic analyte.

#### C2.2.3.5 Sample Shipping

The radiological control technician will measure the contamination levels on the outside of each sample jar and the dose rates on each sample jar. The radiological control technician also will measure the radiological activity on the outside of the sample container (through the container) and will document the highest contact radiological reading in millirem per hour. This information, along with other data, will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the analytical laboratory in accordance with the laboratory's acceptance criteria. Copies of the shipping documentation will be provided to Sample and Data Management within 48 hours of sample shipment. Based on the measured radiological activity, the samples will be shipped to the appropriate Hanford Site-approved laboratory.

### C2.2.4 Analytical Methods

Table C-3 lists the applicable fixed-laboratory methods for analytes and target detection limits.

### C2.2.5 Quality Control

#### C2.2.5.1 Field Quality Control

Field QC samples shall be collected to evaluate the potential for cross-contamination and laboratory performance. Field QC for sampling this 200-IS-1 RCRA TSD unit will require the collection of field duplicate, field split, equipment rinsate blank, and field blank samples. If possible, field duplicate and field split samples should be collected from contaminated areas so valid comparisons between the samples can be made. However, the samples should not be collected from zones that are expected to contain high levels of transuranic-contaminated media because of the high cost and added handling requirements associated with transuranic materials. The QC samples and the required frequency for collection are described in the following subsections.

##### C2.2.5.1.1 Field Duplicates

Each field duplicate shall be retrieved from the sample interval using the same equipment and sampling technique as the original sample. Field duplicates are collected and homogenized before being divided into two samples in the field. If volatile organic analyte (VOA) samples are required, they should be collected before homogenization. The duplicate samples shall be sent to the primary laboratory in the same manner as the routine site samples. Field duplicates provide information regarding the homogeneity of the sample matrix and can be used to evaluate the precision of the analysis process.

At least 5 percent of the total collected samples will be duplicated. At least one field duplicate shall be collected from the waste site. The duplicate sample(s) shall be suitable for analysis by an offsite laboratory and shall be analyzed for all of the COPCs listed in Table C-3.

#### C2.2.5.1.2 Field Splits

Field split samples will be collected at the same frequency as field duplicate samples from each waste site. Each split sample shall be retrieved from the same sample interval using the same equipment and sampling technique as the original sample. Samples shall be homogenized, split into two separate aliquots in the field, and sent to two independent laboratories. If VOA samples are required, they should be collected before homogenization. The splits will be used to verify the performance of the primary laboratory.

The split samples will be obtained from a sample medium that is expected to have some contamination and that is suitable for analysis in an offsite laboratory and shall be analyzed for all of the COPCs listed in Table C-3.

#### C2.2.5.1.3 Equipment Rinsate Blanks

Equipment rinsate blanks are used to verify the adequacy of sampling equipment decontamination procedures and shall be collected for each sampling method or from each type of nondisposable equipment used. Rinsate blanks need only be collected from equipment that undergoes decontamination and is used for repeated sample collection. An equipment rinsate blank shall be taken from each type of decontaminated sampling equipment used for the collection of samples. Rinsate blanks need only be collected from equipment that undergoes decontamination and is used for repeated sample collection. The field team lead can request that additional equipment blanks be taken. Equipment blanks shall consist of deionized water washed through decontaminated sampling equipment and placed in containers identified on the Sampling Authorization Forms. Note that the bottle and preservation requirements for water may differ from the requirements for soil. Equipment rinsate blanks shall be analyzed for the following:

- Gross alpha
- Gross beta
- Metals (excluding hexavalent chromium and mercury)
- Anions (except cyanide)
- VOAs of interest
- Semivolatile organic analytes of interest.

These analytes are considered the best indicators of decontamination effectiveness.

#### C2.2.5.1.4 Field Blanks

The volatile organic field blanks will constitute approximately 5 percent of all volatile organic compound samples. If applicable, at least one field blank shall be collected. Field blanks shall consist of laboratory-grade deionized water added to a clean sample container in the field during the time frame that the characterization samples are being collected. The field blanks shall travel to the field with the associated bottle sets and will be returned to the laboratory with the samples. They will remain closed during subsequent transport and handling. Field blanks are prepared as a check for possible contamination originating from ambient conditions at the site during sample collection. The field blank shall be analyzed for volatile organic compounds only.

#### C2.2.5.1.5 Prevention of Cross-Contamination

Special care should be taken to prevent cross-contamination of samples. Particular care will be exercised to avoid the following common ways in which cross-contamination or background contamination may compromise the samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting them on or near potential contamination sources, such as uncovered ground
- Handling bottles or equipment with dirty hands
- Improperly decontaminating equipment before sampling or between sampling events.

#### C2.2.5.2 Laboratory Quality Control

The laboratory method blanks, duplicates, laboratory control sample/blank spike, and matrix spikes are defined in Chapter 1 of SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-B*, and will be run at the frequency specified in Chapter 1 of SW-846.

### C2.2.6 Instrument and Equipment Testing, Inspection, and Maintenance

Measurement and testing equipment used in the field or in the laboratory that directly affects the quality of analytical data will be subject to preventive maintenance measures to ensure minimization of measurement system downtime. Laboratories and onsite measurement organizations must maintain and calibrate or verify calibration of their equipment in accordance with manufacturer or other applicable guidelines. Maintenance requirements (such as parts lists and documentation of routine maintenance) will be included in the individual laboratory and the onsite organization quality assurance plan or operating procedures (as appropriate).

### C2.2.7 Instrument and Equipment Calibration and Frequency

Calibration of laboratory instruments will be performed in a manner consistent with SW-846 or with auditable DOE Hanford Site-wide and contractual requirements. Calibration of radiological field instruments will be performed as indicated in the discussion regarding radiological field instrumentation data.

### C2.2.8 Inspection and Acceptance of Supplies and Consumables

Supplies and consumables used in support of sampling and analysis activities are procured in accordance with internal work requirements and processes that describe the acquisition system

and the responsibilities and interfaces necessary to ensure that structures, systems, and components, or other items and services procured/acquired, meet the specific technical and quality requirements. The procurement process ensures that purchased items and services comply with applicable procurement specifications. Supplies and consumables are checked and accepted by users before use. Supplies and consumables obtained by the analytical laboratories are procured, checked, and used in accordance with the laboratories' quality assurance plans.

### C2.2.9 Non-Direct Measurements

From an investigation of historical sources, including process documents, logbooks, and original plant technical manuals, a master list of potential contaminants was identified during the DQO process and was used in determining the analytical requirements.

### C2.2.10 Data Management

Data generated as a result of sampling and data analysis activities will follow requirements outlined in this SAP and shall be managed and stored in accordance with applicable programmatic requirements governing data management procedures. At the direction of the task lead, all analytical data packages shall be subject to final technical review by qualified personnel before the results are submitted to the regulatory agencies or before inclusion in reports. Electronic data access, when appropriate, shall be via a database (e.g., HEIS or a project-specific database). Where electronic data are not available, hard copies shall be provided in accordance with Section 9.6 of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989).

Data will be cross-referenced between laboratory analytical data and radiation measurements to facilitate interpreting the investigation results. Errors reported by the laboratories are reported to the Sample Management Project coordinator, who initiates a Sample Disposition Record in accordance with Project Hanford Management Contractor procedures. This process is used to document analytical errors and to establish the resolution with the project task lead. In addition, the Project Hanford Management Contractor Quality Assurance engineer receives quarterly reports that provide narrative summaries and summary statistics of the analytical errors.

## C2.3 ASSESSMENT AND OVERSIGHT

Routine evaluation of data quality described for this project will be documented and filed along with the data in the project file.

### C2.3.1 Assessments and Response Action

The Fluor Hanford Compliance and Quality Programs group may conduct random surveillance and assessments to verify compliance with the requirements outlined in this SAP, project work packages, the project quality management plan, procedures, and regulatory requirements.

Deficiencies identified by these assessments shall be reported in accordance with existing programmatic requirements. The central quality assurance group coordinates the corrective actions/deficiencies in accordance with the Fluor Hanford Management Contractor Quality Assurance Program. When appropriate, corrective actions will be taken by the task lead.

### C2.3.2 Reports to Management

Management will be made aware of all deficiencies identified by self-assessments. Identified deficiencies will be reported to the Fluor Hanford Management Contractor 200 Areas Waste Site Remediation manager, as appropriate.

### C2.3.3 Changes in Workscope

Changes to the workscope detailed in the SAP may be required because of unexpected field conditions, new information, health and safety concerns, or other anomalies. Minor changes that have no adverse effect on the DQOs or project schedule can be made in the field with the approval of the project manager or assigned task lead and then documented in the daily field logbook and/or field summary reports. Changes that affect the DQOs will require concurrence by RL and the lead regulatory agency and can be documented through unit managers' meetings. Alternatively, if substantial changes are required, this SAP can be revised and reissued, requiring RL and regulator approval.

## C2.4 DATA VALIDATION AND USABILITY

### C2.4.1 Data Review, Verification, and Validation

Data review and verification activities include checking completeness of laboratory analytical data packages (e.g., complete laboratory QC documentation, all data results present, data narrative summary is complete, and all report pages are present). Verification shall consist of confirming the required deliverables, requested versus reported analyses, and transcription errors. Validation shall include the evaluation and qualification of results based on holding time, method blanks, matrix spikes, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate to the methods used. No other validation or calculation checks will be performed.

### C2.4.2 Verification and Validation Methods

Verification activities will be completed by qualified Groundwater Remediation Project Sample Management personnel. Validation shall be performed on completed data packages by qualified Groundwater Remediation Project Sample Management personnel or by a qualified independent contractor. At least 5 percent of all data shall be validated. Validation requirements will be consistent with Level C validation. No validation will be performed for physical data.

### C2.4.3 Reconciliation With User Requirements

The data quality assessment process compares completed field-sampling activities to those proposed in corresponding sampling documents and provides an evaluation of the resulting data. The purpose of the data evaluation is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project DQOs. EPA/600/R-96/084, *Guidance for Data Quality Assessment, Practical Methods for Data Analysis*, EPA QA/G-9, identifies five steps for evaluating data generated from this project, as summarized below.

**Step 1. Review the Sampling Design.** This step requires a comprehensive review of the sampling and analytical requirements outlined in the SAP.

**Step 2. Conduct a Preliminary Data Review.** In this step, a comparison is made between the actual quality assurance/QC achieved (e.g., detection limits, precision, accuracy) and the requirements determined during the DQO. Any significant deviations will be documented. Basic statistics will be calculated from the analytical data at this point, including an evaluation of the distribution of the data.

**Step 3. Select the Statistical Test.** Using the data evaluated in Step 2, select an appropriate statistical hypothesis test and justify the selection of this test.

**Step 4. Verify the Assumptions.** Assess the validity of the data analyses by determining if the data support the underlying assumptions necessary for the analyses or if the data set must be modified (e.g., transposed, augmented with additional data) before further analysis. If one or more assumptions are questioned, return to Step 3.

**Step 5. Draw Conclusions from the Data.** The statistical test is applied in this step (if applicable to the sample design), and the results either reject the null hypothesis or fail to reject the null hypothesis. If the latter is true, the data should be analyzed further. If the null hypothesis is rejected, the overall performance of the sampling design should be evaluated by performing a statistical power calculation in order to assess the adequacy of the sampling design.

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Problems with borehole drilling, sample collection, sample custody, or data acquisition that affect the quality of data or impair the ability to acquire data due to failure to meet contract requirements, or failure to follow procedures shall be documented. When a problem is encountered with performing field measurements or conducting sampling, cognizant field personnel shall communicate the problem to the task lead for evaluation and resolution.

## C3.2 FIELD MEASUREMENTS

Planned field measurements include surface radiation surveys and radiological field screening.

### C3.2.1 Surface Radiation Surveys

A surface radiation survey will be performed to document existing surface contamination. This information will be used in preparing the supporting health and safety documents and in finalizing the borehole location. The surface radiation survey will be conducted by qualified radiological control technicians in accordance with applicable procedures. A survey report will be prepared. Radiation surveys will be performed in accordance with applicable approved procedures. A survey will be performed at the conclusion of fieldwork to ensure that sampling activities have not contributed to surface contamination.

### C3.2.2 Screening

Using appropriate instrumentation, the radiological control technician or other qualified personnel will field screen the drill cuttings and all sample material generated from the borehole for radioactive contamination. Potential screening instruments are listed in Table C-4 with their respective detection limits. The radiological control technician will record all field measurements, noting the depth of the sample and the instrument reading.

Before drilling, a local area background reading will be taken using the field-screening instruments at a site to be selected in the field. Field screening results will assist in determining radiological activity within the grout, at the grout/waste interface, and within the waste material. These results also will assist in determining sample shipping requirements, and will support worker health and safety monitoring.

Field-screening instruments will be used, maintained, decontaminated (if applicable), and calibrated, or calibration verified, in accordance with the manufacturer's specifications and other approved procedures. Specific instrumentation information and field-screening results are recorded by the radiological control technician or other qualified personnel. The field geologist also will record field-screening results in the borehole logbook. Results are documented in the waste-site characterization summary report prepared by the field geologist.

### C3.2.3 Borehole Sampling and Analysis

A borehole will be installed to characterize the composition of waste within the 241-CX-72 Storage Tank. Actual sampling intervals may vary from the table depending on the location of the top of the waste as indicated by the radiological instrument measurements.

IDW generated during this activity will be handled according to the procedures listed in Chapter C5.0 and the waste control plan (to be prepared/approved before the start of field activities).

### C3.2.4 Pre-Shipment Sample Screening

A representative portion of each sample will be shipped to an offsite laboratory, or will be submitted to the Radiological Counting Facility, 222-S Laboratory, or other suitable onsite laboratory for total activity analysis before shipment. Total radiological activities will be used for sample pre-shipment characterization. Samples that slightly exceed the offsite laboratory criterion may be reduced in volume, to reduce total activity and allow offsite shipment. Onsite and offsite laboratories will be identified before initiating field activities and will be mutually acceptable to the Fluor Hanford, Inc., Sample Management group and the task lead.

## C3.3 SURVEYING

The location of the borehole will be surveyed after the sampling and abandonment activities are completed. Data will be recorded in the *North American Vertical Datum of 1988* and the Washington State Plane (South Zone) *North American Datum of 1983*, with the 1991 adjustment for horizontal coordinates. All survey data will be recorded in meters and feet. Global positioning system survey instrumentation will be used.

## C3.4 WASTE MANAGEMENT SAMPLING

A waste designation DQO effort will be performed immediately before the characterization activities to ensure that the proper information is collected during the field effort to support the designation of all project IDW. Any additional sampling requirements or analytes needed to support waste designation activities will be identified and implemented through the waste designation DQO summary report that will be prepared at that time.

In addition, the data needs of other core projects such as the RL Groundwater Protection Program, ORP, or the Science and Technology Project will be solicited at this time. If practicable, these data needs will be integrated into the IDW DQO as additional sampling requirements or analytes.

# C4.0 HEALTH AND SAFETY

All field operations will be performed in accordance with health and safety requirements and procedures. In addition, documentation will be prepared that will further control site operations. This documentation will consist of an activity hazard analysis, a site-specific health and safety plan, and applicable work permits. Work shall be performed in accordance with site-specific health and safety plans and applicable work permits. The sampling procedures and associated activities will take into consideration exposure reduction and contamination control techniques that will minimize the sampling team's exposure.

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# C5.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

The IDW generated by characterization activities will be managed in accordance with existing approved Fluor Hanford waste management documents, which identify the requirements and responsibilities for containment, labeling, and tracking of IDW. Procedures have been prepared to implement the requirements found in Ecology et al. 1995, "Strategy for Management of Investigation Derived Waste." Management of IDW, minimization practices, and waste types applicable to 200-IS-1 OU waste control will be described in the waste control plan (to be prepared).

Unused samples and associated laboratory waste from offsite laboratory analysis will be dispositioned in accordance with the laboratory contract, which in most cases will allow the laboratory to dispose of this material. The approval of the Remedial Project manager is required before unused samples or waste may be returned from offsite laboratories. Unused sample material from onsite laboratories will be returned to the project for disposal.

A waste designation DQO will be completed before the initiating characterization activities to ensure that information necessary to support designation of all project IDW is collected during the field effort. During the IDW DQO effort, any listed waste issues will be resolved. Additional sampling or analysis required to support designation activities will be identified in the waste designation DQO summary report.

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# C6.0 REFERENCES

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- H-2-4535, *Site Plan + Underground Piping Strontium Facilities*
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# APPENDIX D

# SITE-SPECIFIC INFORMATION FOR 200-IS-1 OPERABLE UNIT PIPELINE-SYSTEM WASTE SITES

# TABLES

1

| Into Metric Units | | | Out of Metric Units | | |
|---|---|---|---|---|---|
| *If you know* | *Multiply by* | *To get* | *If you know* | *Multiply by* | *To get* |
| **Length** | | | **Length** | | |
| inches | 25.40 | millimeters | millimeters | 0.0394 | inches |
| inches | 2.54 | centimeters | centimeters | 0.394 | inches |
| feet | 0.305 | meters | meters | 3.281 | feet |
| yards | 0.914 | meters | meters | 1.094 | yards |
| miles (statute) | 1.609 | kilometers | kilometers | 0.621 | miles (statute) |
| **Area** | | | **Area** | | |
| sq. inches | 6.452 | sq. centimeters | sq. centimeters | 0.155 | sq. inches |
| sq. feet | 0.0929 | sq. meters | sq. meters | 10.764 | sq. feet |
| sq. yards | 0.836 | sq. meters | sq. meters | 1.196 | sq. yards |
| sq. miles | 2.591 | sq. kilometers | sq. kilometers | 0.386 | sq. miles |
| acres | 0.405 | hectares | hectares | 2.471 | acres |
| **Mass (weight)** | | | **Mass (weight)** | | |
| ounces (avoir) | 28.349 | grams | grams | 0.0353 | ounces (avoir) |
| pounds | 0.454 | kilograms | kilograms | 2.205 | pounds (avoir) |
| tons (short) | 0.907 | ton (metric) | ton (metric) | 1.102 | tons (short) |
| **Volume** | | | **Volume** | | |
| teaspoons | 5 | milliliters | milliliters | 0.034 | ounces (U.S., liquid) |
| tablespoons | 15 | milliiiters | liters | 2.113 | pints |
| ounces (U.S., liquid) | 29.573 | milliliters | liters | 1.057 | quarts (U.S., liquid) |
| cups | 0.24 | liters | liters | 0.264 | gallons (U.S., liquid) |
| pints | 0.473 | liters | cubic meters | 35.315 | cubic feet |
| quarts (U.S., liquid) | 0.946 | liters | cubic meters | 1.308 | cubic yards |
| gallons (U.S., liquid) | 3.785 | liters | | | |
| cubic feet | 0.0283 | cubic meters | | | |
| cubic yards | 0.764 | cubic meters | | | |
| **Temperature** | | | **Temperature** | | |
| Fahrenheit | (°F-32)*5/9 | Centigrade | Centigrade | (°C*9/5)+32 | Fahrenheit |
| **Radioactivity** | | | **Radioactivity** | | |
| picocurie | 37 | millibecquerel | millibecquerel | 0.027 | picocurie |

2

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2

# APPENDIX D

## SITE-SPECIFIC INFORMATION FOR 200-IS-1 OPERABLE UNIT PIPELINE-SYSTEM WASTE SITES

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| PW-1 | 216-Z-1, 216-Z-2, 216-Z-3, & 216-Z-1A | 11 | Provides data for the effluent pipeline from Z Plant (234-Z5, 236-Z, & 242-Z Buildings) into the 216-Z-2 Crib, and between the 216-Z-2 and 216-Z-1 Cribs (pp. 13-14) and summary of existing data for 216-Z-1 & -2 Cribs and Tile Field. Also 216-Z-3 overflow into 216-Z-1A Tile Field (p. 24). | 8-in. SS into Crib (p. 13); 8-in. VCP from 216-Z-3 into tile field (p. 24) | not specified | not specified | acidic process, analytical, and development laboratory wastes; aqueous and organic waste; uranium waste (pp. 14-15) | 1 and possible 3 | none | none | none | previous waste-site inventory, scintillation probe, and groundwater sampling data summarized (pp. 18-20, 22); previous crib plutonium/americium sampling results summarized (p. 23) | SS may degrade at low pH.<br>Process used oxalic acid, which breaks down into chelans. |
| | 216-Z-1A & 216-Z-3 | | Provides data for the effluent pipeline from the 234-Z5 Building via the 241-Z-361 Settling Tank into the 216-Z-3 Crib (p. 24) and summary of existing data for 216-Z-3 Crib. Overflow into 216-Z-1A Tile Field (p. 24). | 8-in. VCP (p. 24) | not specified | not specified | neutral/basic process, analytical, and development laboratory wastes (p. 25); low-salt (Ref. 13, p. 6) | 4 | none | none | none | previous waste-site inventory and scintillation probe data summarized (pp. 28-29) | none |
| | 216-Z-9 | 11 | Provides data for the RECUPLEX effluent pipeline from the 234-5Z Building into the 216-Z-9 Trench (pp. 52-53) and summary of existing data for the 216-Z-9 Trench. | not specified | not specified | not specified | acidic, aqueous and organic waste; high salt | 1,2,4 | none | none | none | previous waste-site inventory, scintillation probe, and well groundwater sampling data summarized (pp. 53, 57, 60-61) | RECUPLEX estimates on p. 61 |
| | | 12 | Provides data for the pipelines from the RECUPLEX Facility in 234-5 Z Plant to the 216-Z-9 Trench. | Two 3.8 cm SS lines; one served as a spare (p. 1) | < 20 ft bgs, because trench depth was 20 ft (p. 1) | not specified | high salt content and acidic (containing aluminum, magnesium, calcium, and other metal nitrate salt waste, degraded solvents) (p. 1) | 1,2 | none | none | none | summary of 1973 study of plutonium distribution in the 216-Z-9 Trench, which later was mined and 58 kg of plutonium was removed (pp. 4-5) | SS may degrade at low pH and high heat. |
| | | 19 | Provides summary of existing data for the lines out to the 216-Z-9 Crib. | 1.5-in. Schedule 40 SS | not specified | not specified | not specified | 1,2,4 | none | none | none | none | none |
| | 216-Z-12 | 13 | Provides data for the pipelines from the Z Plant 234-Z, 232-Z, 236-Z, 242-Z, and RECUPLEX processes to 216-Z-12 Crib and summary of existing data for the 216-Z-12 Crib (pp. 16, 18, and 20). | 4-in. VCP connected to 12-in. VCP; sections butted together but not sealed (p. 16) | 17 ft (p. 16, Fig. 8) | not specified | Low salt, slightly basic (pH ~8), aqueous plutonium-bearing laboratory and process waste containing sodium, fluoride, and nitrate (p. 1) | 4 | none | none | none | previous waste-site investigations summarized (pp. 33-50) | Waste from Z Plant process and labs drained to 241-Z Waste Storage Tanks, then (after neutralized) to 241-Z-361 Settling Tank, with overflow to 216-Z-12 Crib via Diversion Boxes 1 then 2 (pp. 16 & 18) |
| | | 11 | Provides data for the effluent pipelines from the 241-Z Neutralization Tank via 241-Z-361 Settling Tank to the 216-Z-12 Crib (p. 68) and summary of existing data for 216-Z-12 Crib. | not specified | not specified | not specified | slightly acidic, low salt process waste (p. 68) | 4 | none | none | none | previous waste-site inventory, scintillation probe, and well groundwater sampling data summarized (pp. 71, 74-75) | none |
| | 216-Z-18 | 11 | Provides data for the effluent pipeline from the 236-Z and 242-Z Buildings into the 216-Z-18 Crib (p. 92) and summary of existing data for the 216-Z-18 Crib. | not specified | not specified | not specified | acidic, high salt waste (p. 92) | 1,2 | none | none | none | previous waste-site inventory, scintillation probe, and well groundwater sampling data summarized (pp. 95, 98-99) | none |
| PW-2 | 216-A-10 | 7 | Provides existing data for the 216-A-10 Crib; mention of associated piping. | 8-in. VCP; replaced in 1962 with 8-in. SS (2.2.3.5) | not specified | Leaks suspected since acidic waste destroyed VCP integrity (2.2.3.5) | PUREX acidic process condensate, acidic process distillate (D002), and corrosive/mixed waste (D002) process distillate (2.2.3.5) containing uranium and nitrate (Table 2-1) | 1 and possible 3 | none | none | none | previous waste-site radionuclide inventory, sampling and logging results, and soil/vegetation contaminant concentrations summarized (2.2.3.5, 3.3.1.5, and Tables 3-4 and 3-5) | In 1987, waste stream diverted to 216-A-45 Crib<br>---<br>See Ref. 16 for waste stream effluent samples before discharge to the crib.<br>Process used oxalic acid, which breaks down into chelans. |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| PW-2 | 216-B-12 | 7 | Provides existing data for the 216-B-12 Crib; mention of associated piping from 221-U, 224-U, and 221-B Buildings (2.2.3.2) into the 216-B-12 Crib. | 6-in. VCP (2.2.3.2) | not specified | not specified | low salt, neutral/basic process condensate including limestone (2.2.3.2); neutral to basic, low salt, containing large amounts of uranium, fission products and tributyl phosphate (Table 2-1) | 4 | none | none | none | previous waste-site radionuclide inventory and logging results summarized (2.2.3.2 and 3.3.1.2). | Operated from 1957 to 1973 |
| | 216-A-36B | 7 | Provides existing data for the 216-A-36B Crib; mention of associated piping from 202-A (PUREX) to the 216-A-36B Crib (southern 500 ft of original 216-B-36 Crib). | not specified | not specified | not specified | ammonia scrubber distillate waste (2.2.3.6); neutral to basic, low salt, containing large amounts of uranium (Table 2-1) | 4 and possible 2 | none | none | none | previous waste-site sampling and logging results, and soil/ vegetation contaminant concentrations summarized (2.2.3.2, 3.3.1.6, and Tables 3-4 and 3-5) | See Ref. 17 for waste stream effluent samples before discharge to the 216-A-36B Crib.<br>Process used NaOH to scrub $NH_3$; aqueous $NH_3$ is basic. |
| | | 17 | Provides waste stream characterization data for PUREX ammonia scrubber condensate that flowed into storage tanks in 1990; flowed into 216-A-36-B Crib until 1987 (p. v). | not specified | not specified | not specified | contains ammonia (p. 2-8) | not specified | none | none | none | four waste stream samples taken (p. 3-1); results reported in Tables 3-2 to 3-5 | none |
| PW-2 & PW-4 | 216-A-10 & 216-A-45 | 16 | Provides waste stream characterization data for PUREX process condensate wastewater stream flow to the 216-A-45 Crib; flowed to 216-A-10 Crib until 1987 (p. 1-4). | not specified | not specified | not specified | process condensate | 1 | none | none | none | eight waste stream samples taken in 1990 (p. 3-1); results reported in Tables 3-2 to 3-6 | NOTE: Diverted waste stream from 216-A-10 Crib to the 216-A-45 Crib in 1987 (p. 1-4) |
| PW-4 | 216-S-22 | 25 | Provides information on the 216-S-22 Crib; mentions associated piping from 293-S Acid Recovery Facility (p. 2-16). | 4-in. VCP (p. 2-16) | 7 ft (p. 2-16) | none mentioned | liquid waste containing nitrate and sodium (p. 2-16) | likely 1 | none | none | none | none | Acid recovery process generated acidic waste. |
| | 216-A-37-1 | 7 | Provides existing data for the 216-A-37-1 Crib; mention of associated piping from 242-A Evaporator to the 216-A-37-1 Crib. | not specified | not specified | not specified | process condensate (2.2.3.8) containing ammonia and mixed waste from solvents (Table 2-1) | 2,4 | none | none | none | results summarized for logging of groundwater wells near waste site; additional data in Section 3.3.1.8 | Process knowledge: waste believed to contain Am-241, Cs-137, H-3, I-129, Pm-147, Pu-239, Ru-106, Sn-113, and Sr-90 (2.2.3.8). |
| PW-5 | 216-B-11A & 216-B-11B | 24 | Provides information on the 216-B-11A and 216-B-11B Reverse Wells; mentions associated pipeline from the 242-B Evaporator (p. 2-31). | 3-in. steel (p. 2-31) | not specified | not specified | low salt, neutral to basic process condensate (p. 2-31) | 4 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, and uranium; "these two wells are placed... in line with a 7.6 cm (3-in.) steel inlet pipe" (p. 2-31) | none |
| PW-6 | 216-Z-4 | 11 | Provides data for the effluent pipeline from the 231-Z Building into the 216-Z-4 Trench (p. 30) and summary of existing data for 216-Z-4 Trench. | not specified | not specified | not specified | neutral/basic process and laboratory waste (p. 30) | 4 | none | none | none | previous waste-site radionuclide inventory data summarized (p. 31) | none |
| | 216-Z-5 | | Provides data for the effluent pipeline from the 231-Z Building into the 216-Z-5 Crib (p. 32) and summary of existing data for 216-Z-5 Crib. Pipeline also may have received 300 Area laboratory wastes (p. 33). | 3-in. SS (p. 32) | ~ 11 ft | not specified | process waste (p. 32); possibly 300 Area laboratory waste (p. 33) | possible 1 | none | none | none | previous waste-site radionuclide inventory, scintillation probe, and well groundwater sampling data summarized (pp. 35-36) | Process solutions were low pH. |
| | 216-Z-6 | | Provides data for the effluent pipeline from the 231-Z Building, via the 231-W-151 Sump Tank into the 216-Z-6 Crib (p. 37) and summary of existing data for the 216-Z-6 Crib. | 3-in. iron (p. 37) | not specified | not specified | neutral/basic process waste (pp. 38) | 4 | none | none | none | previous waste-site radionuclide inventory data summarized (p. 40) | none |
| | 216-Z-8 | | Provides data for the effluent pipeline from the 234-5Z Building, via the overflow from the storage tank, into the 216-Z-8 French Drain (p. 49) and summary of existing data for 216-Z-8 French Drain. | 4-in. steel (p. 49) | not specified | not specified | neutral/basic RECUPLEX filter backflush | 4 | none | none | none | previous waste-site radionuclide inventory data summarized (p. 51) | none |
| | 216-Z-10 | | Provides data for the effluent pipelines from the 231-Z Building into the 216-Z-10 Reverse Well (p. 62) and summary of existing data for the 216-Z-10 Reverse Well. | three 3-in. pipes (p. 62) | 5, 6, and 7 ft (p. 62) | not specified | neutral/basic process and laboratory waste (p. 62) | 4 | none | none | none | previous waste-site inventory reported as 50 g of plutonium; no other radionuclides reported (pp. 62, 64) | |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| SC-1 | 216-T-36 | 6 | Includes limited information on the pipeline carrying steam condensate from the 221-T and 221-U Buildings and from 2706-T Building decontamination into the 216-T-36 Crib. | not specified | 15 ft or less (because the crib depth is 15 ft bgs) (Table 2-4) | not specified | steam condensate, decontamination waste, and miscellaneous waste (Table 2-4) | 2,4 | none | none | none | previous waste-site radionuclide inventory data/ditch information reported (Table C-4, p. C-35/C-36) | The majority of T Plant decontamination wastes were basic. A few were acidic. |
| CW-1 | 207-B | 24 | Provides information on the waste pipeline from the 242-B Evaporator to the 207-B Retention Basin (p. 2-58). | 4-in. cast iron (p. 2-58) | not specified | 5 leaks in 1953, UN-200-E-79 (p. 2-58) | not specified | 4 | none | none | unplanned release occurred when five leaks were detected in the pipeline in June 1953; up to 2,500 cpm detected at points of emission (p. 2-58) | none | none |
| | | 9 | Provides data for the 200-E-112 Pipeline, which consists of two process sewer lines (2904-E-1 and 2904-E-2) that carried B Plant water to the 207-B Retention Basin (Table 2-6). | 2904-E-1 is 24-in. VCP; 2904-E-2 is 15-in. VCP | not specified | not specified for 2904-E-1; 2904-E-2 found leaking in 1985 (Table 2-6) | two process sewer waste (Table 2-6) | 4 | none | none | none | none | A portion of the 2904-E-2 Pipeline was found to be leaking and was repaired in 1985; operated from 1944 to 1997 (Table 2-6). |
| | 207-B, 216-B-3 & B Ponds | 9 | Provides data for the 200-E-126 Pipeline, which extends eastward from the 207-B Retention Basin to the 216-B-3 Ditch and B Pond System (Table 2-6). | 24- to 30-in. corrugated metal, except one connector section (36-in. diameter) made of high-density polyethylene | not specified | leaks inferred in Table 2-6 | not specified | 1,4 | none | none | none | none | Operated from 1945 to 1997 (Table 2-6)<br>Received PUREX effluent, which was 1 or 4 waste type. |
| | 216-B-3 & B Pond System | | Provides data for the 200-E-126 Pipeline, which extends eastward from the 207-B Retention Basin to the 216-B-3 Ditch and B Pond System (Table 2-6). | 24- to 30-in. corrugated metal, except one connector section (36-in. diameter) made of high-density polyethylene | not specified | leaks inferred in Table 2-6 | not specified | 1,4 | none | none | none | none | Operated from 1945 to 1997 (Table 2-6).<br>Received PUREX effluent, which was 1 or 4 waste type. |
| CW-1 | 241-B-154 Diversion Box & 207-B Retention Basin | 24 | Provides information on the 221-B Building cooling water pipeline to the 241-B-154 Diversion Box, then to the 207-B Retention Basin (pp. 2-59 to 2-60). | 24-in. cast iron, 24-in. VCP (p. 2-60) | not specified | 1946 (UN-200-E -80) and 1966 (UN-200-E-1) leaks (p. 2-59) | not specified | 4 | none | none | metal waste leaked from pipeline in 1946, containing ~10 Ci fission products; 1966 leak apparently contained similar waste liquid (p. 2-59) | none | none |
| CW-5 | Z Ditches | 5 | Includes characterization of pipeline from the 231-Z Building to the Z Ditches. | 18-in. VCP (2.1.5) | not specified | leakage suspected (2.1.5) | cooling water, steam condensate, and laboratory waste (Ref. 6, 3.3.2.1) | 4 | remote video (2.1.5) | none | one smear sample collected from pipe interior; analyzed for 17 rad analytes (2.1.5, 3.2.2); detected 23.5 pCi Pu-238, 1210 pCi Pu-239, 226 pCi and 813 pCi Am-241; 14 radionuclides undetected (Appendix C) | none | 216-Z-11 may be difficult to distinguish because ditches overlap; several sources discharged to the 216-Z-11 Ditch (Fig. 2-4 and from Ref. 6: Figure 2-9 and Section 3.3.2). |
| | | | Includes characterization of pipeline from the 234-5 Building to the Z Ditches. | 15-in. VCP (2.1.5) | not specified | leakage suspected (2.1.5) | cooling water and steam condensate; assumed to contain plutonium and other transuranic elements (Ref. 6, 3.3.2.1) | not specified | remote video (2.1.5) | none | one smear sample collected from pipe interior; analyzed for 17 rad analytes (2.1.5, 3.2.2); detected 2.45 pCi Pu-238, 94.6 pCi Pu-239, 19.5 pCi and 23.5 pCi Am-241; 14 radionuclides undetected (Appendix C) | none | 216-Z-11 may be difficult to distinguish because ditches overlap; several sources discharged to the 216-Z-11 Ditch (Fig. 2-4 and from Ref. 6: Figure 2-9 and Section 3.3.2). |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| CW-5 | 216-U-14 | 6 | Includes limited information on pipeline carrying process sewer waste from the 221-U and 271-U Buildings into the 216-U-14 Ditch. | 18-in. VCP (2.2.2.2, 3.3.1.1) | 4 ft or less (because ditch depth is 4 ft bgs) (Table 2-1) | not specified | chemical sewer wastewater, steam condensate, and cooling water (3.3.1.1) | not specified | none | none | none | previous waste-site sampling information reported (Tables 3-1 to 3-4) and summarized (3.3.1.2) | The 216-U-14 Ditch is a representative waste site characterized in Ref. 5.<br>Several pipelines from different sources carried waste to the 216-U-14 Ditch (2.2.2.2, 3.3.1.1, Table 2-9). |
| | 216-Z-20 | 27 | Provides information on the 216-Z-20 Crib; mentions associated piping from the Z Plant (pp. 8-8 and 8-9). | 18-in. VCP (p. 8-9) | not specified | not specified | cooling water, steam condensate, storm sewer, building drain, chemical drains, laboratory drains, and miscellaneous drain waste (p. 8-8) | 1,4 | none | none | none | none | Crib is classified as a low-level waste site (p. 8-8).<br>Chemical drain would convey acidic wastes. |
| | | | Provides information on the 216-Z-20 Crib; mentions associated piping from the Z Plant (pp. 8-8 and 8-9). | 15-in. VCP (p. 8-9) | not specified | not specified | cooling water, steam condensate, storm sewer, building drain, chemical drains, laboratory drains, and miscellaneous drain waste (p. 8-8) | not specified | none | none | none | none | Crib is classified as a low-level waste site (p. 8-8).<br>Chemical drain would convey acidic wastes. |
| LW-1 | 216-T-28 | 26 | Provides information on the 216-T-28 Crib; mentions associated piping from the 221-T Buildings, 2706-T Building, and 300 Area laboratory waste from the 340 Building (pp. 2-17 & 2-18). | 14-in. steel reducing to 10-in. steel (p. 2-17) | 8 ft (p. 2-17) | not specified | liquid mixed waste containing nitrate; steam condensate decon. waste, misc. effluent, decon. waste, and laboratory waste (pp. 2-17 to 2-18) | 2,4 | none | none | none | none | Many of the decontamination wastes at T Plant were basic. |
| LW-2 | 216-Z-7 | 11 | Provides data for the effluent pipeline from the 231-Z Building, via the 231-W-151 Sump Tank, into the 216-Z-7 Crib (p. 42) and summary of existing data for the 216-Z-7 Crib. Also 300 Area laboratory waste from the 340 Waste Neutralization Facility (p. 42). | 3-in. iron (p. 41) | not specified | not specified | 231-Z process, laboratory, and operations waste; 300 Area laboratory waste (p. 42). | 4 | none | none | none | previous waste-site inventory, scintillation probe, and well groundwater sampling data summarized (pp. 45, 47-48) | none |
| | 216-Z-16 | | Provides data for the effluent pipeline from the 231-Z Building into the 216-Z-16 Crib (p. 82) and summary of existing data for the 216-Z-16 Crib. | not specified | not specified | not specified | neutral/basic Pacific Northwest Laboratory operations waste (p. 82) | 4 | none | none | none | previous waste-site inventory, scintillation probe, and well groundwater sampling data summarized (pp. 85-86) | none |
| | 216-Z-17 | | Provides data for the effluent pipeline from 231-Z Building into the 216-Z-17 Trench (p. 87) and summary of existing data for 216-Z-17 Trench. | 3-in. schedule 40 carbon steel (p. 87) | not specified | not specified | neutral/basic Pacific Northwest Laboratory operations waste (p. 87) | 4 | none | none | none | previous waste-site radionuclide inventory data summarized (pp. 85-86, 90) | none |
| MW-1 | 216-Z-13 | 11 | Provides data for the effluent pipeline from the 291-Z Building into the 216-Z-13 French Drain (p. 76) and summary of existing data for the 216-Z-13 French Drain. | 4-in. pipe (p. 76) | ~ 14 ft | not specified | ET-8 exhaust fan steam condensate and floor drainage (p. 76) | 4 | none | none | none | none | Radionuclide content is unknown; low levels are assumed (p. 76) |
| | 216-Z-14 | | Provides data for the effluent pipeline from the 291-Z Building into the 216-Z-14 French Drain (p. 78) and summary of existing data for the 216-Z-14 French Drain. | 4-in. pipe (p. 78) | ~ 14 ft | not specified | ET-9 exhaust fan steam condensate (p. 78) | 4 | none | none | none | none | Radionuclide content is unknown; low levels are assumed (p. 78) |
| | 216-Z-15 | | Provides data for the effluent pipeline from the 291-Z Building into the 216-Z-15 French Drain (p. 80) and summary of existing data for the 216-Z-15 French Drain. | 4-in. pipe (p. 80) | ~ 14 ft | not specified | S-12 evaporator cooler drainage (p. 80) | 4 | none | none | none | none | Radionuclide content is unknown; low levels are assumed (p. 80) |
| | 216-U-7 | 27 | Provides information on the 216-U-7 French Drain; mentions associated piping from the 221-U Counting Box (p. 9-7). | 3-in. schedule 40 steel (p. 9-7) | 13 ft (p. 9-7) | not specified | liquid waste from counting box floor drain (p. 9-7) | not specified | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | none |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| TW-1 | 200-E-114 Pipeline | 14 | Develops conceptual approach to closure of ancillary equipment (pipelines, Diversion Boxes, and similar structures) based on C Tank Farm (p. ES-1); includes limited information on the 200-E-114 Pipeline. | two 4-in. steel lines (p. 2-20) | not specified | leak suspected – unplanned release site (p. 2-19) | not specified | possible 2 | none | none | none | none | Used for transfer of tank farm liquid waste, which was basic |
| | 216-B-14 | 24 | Provides information on the 216-B-14 Crib; mentions associated pipeline from 221-U Building (p. 2-20). | 14-in. steel (p. 2-20) | not specified | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-20) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, sulfate-based compounds (p. 2-20) | none |
| TW-1 | 216-B-15 | | Provides information on the 216-B-15 Crib; mentions associated pipeline from 221-U Building (p. 2-21). | 14-in. steel (p. 2-21) | 6 ft (p. 2-21) | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-21) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, and sulfate-based compounds (p. 2-21) | none |
| | 216-B-16 | | Provides information on the 216-B-16 Crib; mentions associated pipeline from 221-U Building (pp. 2-21 and 2-22). | 14-in. steel (p. 2-21) | 6 ft (p. 2-21) | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-22) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, and sulfate-based compounds (p. 2-22) | none |
| | 216-B-17 | | Provides information on the 216-B-17 Crib; mentions associated pipeline from 221-U Building (p. 2-22). | 14-in. steel (p. 2-22) | 6 ft (p. 2-22) | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-22) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, and sulfate-based compounds (p. 2-22) | none |
| | 216-B-18 | | Provides information on the 216-B-18 Crib; mentions associated pipeline from 221-U Building (p. 2-22). | 14-in. steel (p. 2-22) | 6 ft (p. 2-22) | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-22) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, and sulfate-based compounds (p. 2-22) | none |
| | 216-B-19 | | Provides information on the 216-B-19 Crib; mentions associated pipeline from 221-U Building (p. 2-23). | 14-in. steel (p. 2-23) | 6 ft (p. 2-23) | not specified | high salt, neutral/basic scavenged tributyl phosphate waste (p. 2-23) | 2 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, ferrocyanide, nitrate, phosphate, sodium, and sulfate-based compounds (p. 2-23) | none |
| | 216-T-18 | 26 | Provides information on the 216-T-18 Crib; mentions associated piping from 221-T Building (p. 2-15). | 14-in. steel reducing to 10-in. steel (p. 2-15) | 8 ft (p. 2-15) | not specified | first-cycle scavenged tributyl phosphate supernatant wastes (p. 2-15) | not specified | none | none | none | none | Mentions "above-ground piping was removed…at completion of discharge" (p. 2-15); reference to inlet pipeline? |
| | 216-T-26 | | Provides information on the 216-T-26 Crib; mentions associated piping from the T Plant (pp. 2-16 and 2-17). | 14-in. steel reducing to 10-in. steel (p. 2-16) | 9 ft (p. 2-16) | not specified | first-cycle scavenged tributyl phosphate supernatant wastes; mixed waste containing ferrocyanide and other inorganics (pp. 2-16 to 2-17) | not specified | none | none | none | none | none |
| TW-2 | 216-B-7A & 216-B-7B | 24 | Provides information on the 216-B-7A and 216-B-7B Cribs; mentions associated piping (pp. 2-16 to 2-17). | 3-in. steel (p. 2-16) | not specified | not specified | 1946-1961, low salt, alkaline rad waste from B Plant; 1961-1967, decon. construction waste from 221-B Bldg. (p. 2-17) | 4 | none | none | none | waste contained Cs-137, Ru-106, Sr-90, plutonium, uranium, and transuranic waste (p. 2-17) | One pipeline supplied both cribs simultaneously (p. 2-16). |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| TW-2 | 216-B-9 | 24 | Provides information on the waste pipeline from the 221-B Building to the 216-B-9 Crib (pp. 2-58 to 2-59). | 3.5-in. SS, unencased (p. 2-59) | 7 ft (p. 2-59) | 1954 leak, UN-200-E-7 (p. 2-58) | not specified | likely 1 | none | none | unplanned release occurred when a leak developed in the waste line; 1.7 rem/h contamination (p. 2-58) | none | WIDS associates leak with 241-B-361 Settling Tank (see discussion on pp. 2-58 to 2-59); monitoring well 299-E28-54 is very close to leak location (p. 2-59). This crib was designed for 1st cycle precipitation waste, which was acidic. |
| IS-1 | Cross-site transfer pipes (241-UX-154 & 241-ER-151) | 15 | Provides information on the cross-site transfer pipelines, between 241-UX-154 Diversion Box and 241-ER-151 Diversion Box (p. ES-1); UPR-600-20 is associated with the Cross-Site Transfer System (2-1, 2-3). | six 3-in. type 347 SS lines in steel-reinforced concrete containment structure (pp. ES-1, 2-2) | 5 ft to 15 ft (p. 2-2) | 4 of 6 plugged (ES-1) | high- and low-level radioactive waste; liquid waste for evaporative concentration (2-1) | 2 | none | To characterize the integrity of the pipeline, eight boreholes were auger drilled at four locations along the transfer line in 1988 (p. 2-5). | "No contamination was found below the encasement, but contamination was found in adjacent sagebrush, indicating that the roots had penetrated the encasement" (2-5). NOTE: In May 1995, the U.S. Department of Energy tested one of the remaining lines using pressurized water; results showed the line was intact. It was used to transfer supernatant from double-shell tank 241-SY-102 to the 200 Areas in August 1995 (p. 2-1). | none | UPR-600-20 consists of contaminated pipeline and encasement, any subsurface leaks, associated surface speck contamination, and contaminated vegetation on the surface of the cross-site transfer line. The surface above the pipeline became contaminated through biological transport of radioactive materials that leaked in the pipeline encasement and windblown particulates from the vent station (2-5). Waste was adjusted to high pH before transfer. |
| | | 28 | Provides information on investigation along the cross-site transfer pipelines between 241-UX-154 Diversion Box and 241-ER-151 Diversion Box (p. 2) | six 3-in. internal diameter schedule 10S type 347 SS lines in steel-reinforced concrete encasement (p. 2) | 5 ft to 15 ft (p. 2) | not specified | not specified | 2 | none | Soil samples from eight auger holes at four locations along the pipeline (p. 8) | Soils near the encasement were free from contamination (p. 11); radiation found in adjacent sagebrush indicates that the roots have penetrated the encasement; caps have been left off swab risers during sampling, which could account for some contamination near risers (p. 14). Additional results on p. 12. | Soil surveys and analysis of vegetation, animals, and feces were conducted in June 1988 to determine if encasement was leaking (pp. 5, 8, and 11). | Associated with tank farm waste, which was high pH |
| | 241-BX-154 Diversion Box | 24 | Provides information on two waste pipelines (V335 and V336) from the 221-B Building to the 241-BX-154 Diversion Box (p. 2-59). | unencased (p. 2-59) | 3.5 ft (p. 2-59) | 1951 (UN-200-E-3) and 1972 (UN-200-E-85) leaks (p. 2-59) | not specified | 2,4 | none | none | pipeline was not repaired after 1951 leak, because readings of 120 rem/h were detected with 46 cm (18 in.) of soil remaining (p. 2-59) | none | Associated with tank farm waste, which was high pH |
| IS-1 | 241-BX-154 Diversion Box | 24 | Provides information on two steam condensate waste pipelines (V200 and V334) from sections 10 and 9, respectively, of the B Plant Concentrator (221-B Bldg) to the 241-BX-154 Diversion Box (p. 2-59). | 3.5-n SS (p. 2-59) | ~12 ft (p. 2-59) | two 1972 leaks, UN-200-E-103 and UN-200-E-44 (p. 2-59) | not specified | 2,4 | none | none | second leak probably resulted from failure of repairs made after the first leak (p. 2-59) | none | Associated with tank farm waste, which was high pH |
| | 200-E-111 Pipeline | 14 | Develops conceptual approach to closure of ancillary equipment (pipelines, diversion boxes, and similar structures) based on C Tank Farm (ES-1); includes limited information on the 200-E-111 pipeline. | three 3-in. SS lines numbered V108, 8618, and 8653 (p. 2-19) | not specified | leak suspected – unplanned release site (p. 2-19) | not specified | 2,4 | none | none | none | none | Associated with tank farm waste, which was high pH |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| IS-1 | 200-E-116 Pipeline to 241-C-151 and -152 Diversion Boxes | 14 | Develops conceptual approach to closure of ancillary equipment (pipelines, diversion boxes, and similar structures) based on C Tank Farm (p. ES-1); includes limited information on the 200-E-116 Pipeline, which transported waste from the B Plant (241-B-154 Diversion Box) to the 241-C-151 and 241-C-152 Diversion Boxes in the C Tank Farm (p. 2-20). | two SS lines marked V130 and V111 (also known as 8902) (p. 2-20) | not specified | leak suspected - unplanned release site (p. 2-19) | radioactive mixed waste (p. 2-20) originating from B Plant | 2,4 | none | none | none | none | The 241-C-151 Diversion Box was determined to be the source of UPR-200-E-68 (p. 2-21). Associated with tank farm waste, which was high pH. |
| UW-1 | 216-U-1 & 216-U-2 | 3 | For pipeline from U Plant to 216-U-1/2 Cribs: provides remote camera survey for pipe integrity; sampling of liquid within pipeline (4.2). | 3.5-in. outside diameter SS; joints are butt-welded (4.2) | 7 ft (4.2.2) | No | acidic and high in radionuclides (4.2) | 1 | Yes | none | liquid from within the pipe was collected (4.2.2); pipe was intact with liquid in low spots (5.0); last 20-30 ft went on line before the 241-U-361 Settling Tank was filled with liquid; none of the soils exterior to the pipe showed signs of contamination (5.0); results to be reported in the 200-UP-2 limited field investigation summary report (4.2.2) | Surface rad survey (3.1.4.3) | none |
| | | 4 | Additional information on activities reported in Ref. 3b; also reported 216-U-1/2 characterization data and operable unit risk assessment. | 3.5-in. SS pipeline | not specified | not specified | not specified | 1 | none | none | Wipe samples of pipeline interior showed up to 30,000 cpm, but the exterior of the pipe and the surrounding soils showed no activity (3.2.3). | Waste-site surface rad survey and soil sampling and subsurface gamma logging and soil sampling results discussed (3.2.1 to 3.2.5 and Tables 3-1 and 3-2) | SS may degrade at low pH and high heat. |
| | 216-U-4A | 27 | Provides information on the 216-U-4A French Drain; mentions associated piping from the 216-U-4 Reverse Well (p. 9-6). | 3-in. SS (p. 9-6) | ~6 ft (p. 9-6) | not specified | acidic plutonium and fission product decontamination waste (p. 9-6) | 1 | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | SS may degrade at low pH and high heat. |
| | 216-U-8 & 216-U-12 | 27 | Provides information on the 216-U-8 Crib; mentions associated piping from the 221-U and 224-U Buildings and the 291-U Stack (p. 9-8). | 6-in. VCP in a 12-in. concrete encasement (p. 9-8) | not specified | not specified | acidic process condensate and stack drainage (p. 9-8) | 1 | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | none |
| | | | Provides information on the 216-U-8 Crib; mentions associated pipeline from the 216-U-8 Crib feed line; waste from the 224-U Buildings, 291-U Stack, and tanks C-5 and C-7 (p. 9-9). | 6-in. VCP (p. 9-9) | not specified | not specified | acidic process condensate, stack drainage, tank, and storm drain wastes (p. 9-9) | 1 | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | none |
| | | 3 | For pipeline from 222-U and 224-U Buildings to 216-U-8/-12 Cribs: provides remote camera surveys for pipe integrity (4.1), surface soil and vegetation sampling (3.2, 4.1), subsurface soil sampling (4.1), and surface rad survey (3.1.4.3). | 6-in. VCP with acid-proof joints (4.1) | 7-12 ft (3.1.4.3) | leaks suspected because of joint condition (4.1.2.1) | acidic (4.1) | 1 | 115 m of older (to 216-U-8) pipe section and 25 m of newer (to 216-U-12) pipe section (Fig. 5) | soil samples (23) collected from seven areas at surface, at pipe depth, and midway between along the path of older (216-U-8) pipe section (4.1.2.2, Figure 7); analysis was for rad and select chemical constituents (3.0) | pipe relatively intact except joints of older section (5.0); sampling results summarized in App. A and App. B. | surface rad survey (3.1.4.3) showed clear pattern where VCP was located (4.1.1) | NOTE: Schedule 40 SS pipe routed around 2715-U Building, then changes to a 6-in. VCP as reported here (4.1). |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| UW-1 | 216-U-8 & 216-U-12 | 4 | Reported additional information on pipeline activities reported in Ref. 3a; also reported 216-U-8/12 Crib characterization data and operable unit risk assessment. | 6-in. VCP | not specified | Leaks suspected because of joint condition (3.4.2) | not specified | 1 | none | 18 soil and 8 vegetation samples | Maximums generally were found near VCP (except in vegetation for Sr-90); lateral movement of contaminants was minimal (3.4.3); sample results for maximum concentrations in Tables 3-4 and 3-5; many of the older (216-U-8) joints were dislodged; the degree of dislodging varied from minor to very serious (3.4.2). | waste-site sampling and borehole logging results (3.4.3 to 3.4.5 and Tables 3-4 to 3-7) | none |
| | | 7 | Provides existing data for the 216-U-8 Crib, with information on the pipeline that carried waste from the 221-U and 224-U Tanks and the 291-U-1 Stack (2.2.3.3) to the 216-U-8 Crib. | 6-in. VCP (2.2.3.3) | not specified | leaks suspected because of joint condition (3.3.1.3) | acidic process condensate and stack drainage (2.2.3.3) | 1 | none | vegetation sampling near pipeline | detected 426 pCi/g Am-241, 49,100 pCi/g Cs-137, 70.6 pCi/g Pu-239/240, and 1,380 pCi/g Sr-90 (3.3.1.3, Tables 3-2 and 3-3) | previous waste-site logging results, borehole data, and soil/vegetation contaminant concentrations summarized (3.3.1.3 and Tables 3-2 to 3-5) | Operated from 1952 until crib was replaced by 216-U-12 in 1960 (2.2.3.3) |
| | | | Provides existing data for the 216-U-12 Crib, with information on the pipeline carrying waste from the U Plant (291-U-1 Stack drainage, 244-WR Vault waste, 224-U process condensate, storm drain, and Tank C-7 waste, 224-B waste from Tanks C-5 and C-7 [2.2.3.4]) to the 216-U-12 Crib. | 6-in. VCP | 17 ft at crib inlet (3.3.1.4) | not specified | corrosive (D0002) mixed waste (2.2.3.4) containing nitrate and tributyl phosphate | not specified | none | none | none | Previous waste-site soil/vegetation sampling and logging results summarized (2.2.3.4, 3.3.1.4 and Tables 3-4 and 3-5) | Replaced 216-U-8 Crib in 1960, and was replaced by 216-U-17 Crib in 1988.<br>Pipeline runs from 216-U-8 Crib feed line to 216-U-12 Crib. |
| UW-1 | 216-U-8 | 27 | Provides information on the 216-U-8 Crib; mentions associated piping between the three crib structures (p. 9-8). | 6-in. schedule 40 steel (p. 9-8) | not specified | not specified | acidic process condensate and stack drainage (p. 9-8) | 1 | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | SS may degrade at low pH and high heat. |
| | 216-U-16 | 27 | Provides information on the 216-U-16 Crib; mentions associated pipeline from 224-U, 221-U, and 271-U (pp. 9-11 and 9-12). | from distribution box through two 8-in. PVC header pipes (p. 9-11) | not specified | not specified | steam and process condensate, chemical sewer waste, and compressor cooling water (p. 9-12) | not specified | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | none |
| | 216-U-17 | 27 | Provides information on the 216-U-17 Crib; mentions associated pipeline from $UO_3$ process condensate (p. 12). | 6-in. poly-ethylene | not specified | not specified | process condensate | not specified | none | none | none | Appendix B shows radionuclide inventory and hazardous chemical inventory. | none |
| | | 18 | Provides waste stream characterization data for $UO_3$ Plant condensate stream that flowed from 224-U to the 216-U-17 Crib until July 1989, when discharge was temporarily suspended (pp. v, 2-5). | not specified | not specified | not specified | neutralized process condensate | not specified | none | none | none | 5 waste stream samples taken in 1990 (p. 3-1); results in Appendix A, Tables 3-2 and 3-3 | NOTE: Moved waste stream from 216-U-12 Crib to 216-U-17 Crib in 1988 (p. 1-4). |
| | 241-C-152 Diversion Box | 1 | Provides data summary from investigation of leak in the V-122 line that carried 221-B Building cesium ion-exchange process feed from the 241-C-105 Tank to the 241-C-152 Diversion Box (p. 2). | 3-in. SS to 3-in. carbon steel (p. 3) | 11 ft (p. 3) | Leak near the 241-C-152 Diversion Box; at joint with polyethylene gasket (p. 2) | high-level liquid waste containing Cs-137 as a major constituent (p. 2) | not specified | none | soil samples collected from 10 wells drilled from 4 to 16 ft from pipeline leak source and to depths of 30 ft (p. 2) | radiological data used to plot three general concentration zones (Fig. 7, p. 12); radionuclides reported were Cs-137, Ce-144, Zr, Nb-95, Ru-106, and Cs-134 (p. 3); soil results summarized (p. 13) | none | none |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| Waste Management Area | 241-C-151, -152, and -153 Diversion Boxes | 20 | Planned UPR-200-E-82 borehole sampling and near-surface characterization using direct pushes (pp. 6-14 & 6-17). Will provide geophysical data and soil samples near the 241-C-151, -152, and -153 Diversion Boxes (and an unplanned release site near the 241-C-152 Diversion Box – p. 6-7). | not specified | not specified | Past leak event (p. 6-7) | high-activity derivatives of PUREX waste (p. 6-7) | 2,4 | none | samples to be collected | to be reported: data for a complete set of radiological and chemical contaminants (p. 6-14) | Samples may be collected. | Purposes: to determine extent and magnitude of vertical Tc-99 migration (p. 6-13); to provide useful indication of effects of tank structures on infiltration rates (p. 6-7; to provide pipeline status, sample the pipe, or external pipe tests (pp. 6-13 to 6-14); and to provide contaminant concentration and distribution data (p. 6-18). Field reports for geophysical logging will be prepared after direct pushes are completed. |
| Waste Management Area | 241-B-151, -152, and -153 Diversion Boxes | 21 | Will provide geophysical data and the potential for soil samples near the 241-B-151, -152, and -153 Diversion Boxes (unplanned release site – p. 5-4). | not specified | not specified | metal waste leaks in vicinity of 241-B-151, -152, and -153 Diversion Boxes (p. 5-5) | metals, uranium, and possibly Tc-99 (Ref. 21, p. 4-10) | not specified | none | Samples may be collected near corners of Diversion Boxes from 10 ft bgs to base of the tanks (p. 4-10). | to be reported: gamma logging and potential soil sampling results (p. A-25) | Samples may be collected. | Purpose: to determine effectiveness of reported past clean-up and whether additional investigations are required (p. A-25). Field reports will be prepared after direct pushes are completed. |
| Various | Multiple | 2 | Provides summary of existing information on various waste sites. | not specified | not specified | not specified | not specified | not specified | none | none | none | none | none |
| | C Tank Farm | 22, 23 | Provides information about eight borings drilled to assess soils adjacent to leak in process transfer line from 244-AR Vault to the C Tank Farm (Ref. 22, Vol 1, p. 102; Ref. 23, p. 1). | 2-in. line; carbon steel and SS (Ref. 22, Vol 1, p. 104; Ref. 23, p. 2) | 8 ft (Ref. 22, Vol 1, p. 104; Ref. 23, p. 2) | line leak (Ref. 22, Vol 1, p. 102; Ref. 23, p. 1) | process waste containing Cs-137 (Ref. 22, Vol 1, p. 102; Ref. 23, pp. 1- 2) | not specified | none | soil samples collected from eight test wells; number of samples not specified (Ref. 22, Vol 1, p. 104; Ref. 23, p. 2) | 8 test wells (Ref. 22, Vol 1, p. 103; Ref. 23, p. 1); soil contamination up to 334 $\mu$Ci/g Cs-137; samples near pipeline showed contamination zone near location of a carbon steel to SS joint in the pipeline (Ref. 22, Vol 1, pp. 104, 106; Ref. 23, pp. 2,4) | none | none |
| | Pipes under 221-U Building | 8 | Provides data for two (north and south) sections of drainline under 221-U Process Cells into Tank 5-6 in 221-U Process Cell 10 (2.4.4) as part of further characterization activities identified in the Phase 1 feasibility study (2.4). | 24-in. VCP under building (2.4.4) | not specified | none detected (2.4.4) | not specified | not specified | remote video and gamma (2.4.4) | none | Two (one each from south and north sections) "opportunistic" samples of residual on robotic crawler were collected from inside the pipe (2.4.4); south section sample contained rad levels ~2 orders of magnitude greater than in the north section, where transuranic activity >100 nCi/g, and elevated levels of chromium, lead, and Aroclor-1254 (expired trademark) occurred. The north section sample contained elevated mercury and phthalates (2.4.4); for both samples ("radionuclide concentrations characteristic of the 221-U facility and processes"). Overall dose rates in pipe ~100 mrem/h (2.4.4). Complete sample data in Table 2-2. | none | none |

Table D-1. Summary of Existing Characterization Data for Pipelines Systems. (10 Pages)

| Process Waste Operable Unit | Disposal Sites with Assoc. Pipes | Ref. Source (see footnotes) | Summary of Applicable Information | Pipeline Attributes | | | | | Available Types of Characterization Data | | | | Other Results/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Pipe Material Type | Pipe Depth (bgs) | Leaks/Plugs | Waste Stream Info. | Waste Type* | Camera Surveys Inside Pipelines | Soil or Vegetation Sampling Adjacent to Pipeline | Additional Pipeline Information/Results | Related Data | |
| Various | Pipes under 221-U Building | 10 | Provides summary of existing data for a cell drainage tile line to cell 10 in 221-U. | 24-in. VCP encased (within building) | not specified | not specified | not specified | not specified | none | none | none | none | none |

Referenced Sources:


1 ARH-1945, *B Plant Ion Exchange Feed Line Leak.*
2 ARH-2155, *Radioactive Liquid Waste Disposal Facilities 200 West Area.*
3 BHI-00033, Rev. 0, *Surface and Near-Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit.*
4 DOE/RL-95-13, Rev. 0, *Limited Field Investigation for the 200-UP-2 Operable Unit.*
5 DOE/RL-2003-11, *Remedial Investigation for: the 200-CW-5 U Pond/Z Ditches Cooling Water Group, the 200-CW-2 S Pond and Ditches Cooling Water Group, the 200-CW-4 T Pond Cooling Water Group, and the 200-SC-1 Steam Condensate Group Operable Units.*
6 DOE/RL-99-66, Rev. 1, *U Pond/Z Ditches Cooling Water Group Operable Unit RI/FS Work Plan, Including the 200-CW-5, 200-CW-2, 200-CW-4, and 200-SC-1 Operable Units.*
7 DOE/RL-2000-60, Rev. 1, Re-issue, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Unit RI/FS Work Plan and RCRA TSD Unit Sampling Plan.*
8 DOE/RL-2001-11, Rev. 0, *Final Feasibility Study for the Canyon Disposition Initiative (221-U-Facility).*
9 DOE/RL-2002-69, *Draft A Feasibility Study for the 200-CW-1 and the 200-CW-3 Operable Units and the 200 North Area Waste Sites.*
10 HW-19140, *Uranium Recovery Technical Recovery Manual.*
11 RHO-LD-114, *Existing Data On the 216-Z Liquid Waste Sites.*
12 RHO-ST-21, *Report on Plutonium Mining Activities at 216-Z-9 Enclosed Trench.*
13 RHO-ST-44, *216-Z-12 Transuranic Crib Characterization: Operational History and Distribution of Plutonium and Americium.*
14 RPP-20604, *Ancillary Equipment Disposition Study.*
15 RPP-20605, *Cross-Site Transfer System Disposition Study.*
16 WHC-EP-0342, Addendum 12, *PUREX Plant Process Condensate Stream-Specific Report.*
17 WHC-EP-0342, Addendum 14, *PUREX Plant Ammonia Scrubber Condensate Stream-Specific Report.*
18 WHC-EP-0342, Addendum 19, *UO3 Plant Process Condensate Stream-Specific Report.*
19 WHC-SD-NR-ER-103, *Final Report for the Remote CCTV Survey of Abandoned Process Effluent Drain Lines 840 and 840D in Support of the 200 West Area Carbon Tetrachloride ERA.*
20 RPP-16608, Rev. 1, *Site-Specific Single-Shell Tank Phase 1 RCRA Facility Investigation/Corrective Measures Study Work Plan Addendum for Waste Management Areas C, A-AX, and U.*
21 RPP-6072, Rev. 1, *Site-Specific SST Phase 1 RFI/CMS Work Plan Addendum for WMA-B-BX-BY.*
22,23 ARH-1972, included in RHO-CD-673 as pp. 103-106, *Handbook 200 Areas Waste Site (RHO-CD-673); PSS Line Leak (Line No. 812).*
24 DOE/RL-92-05, *B Plant Source Aggregate Area Management Study Report.*
25 DOE/RL-91-60, *S Plant Source Aggregate Area Management Study Report.*
26 DOE/RL-91-61, *T Plant Source Aggregate Area Management Study Report.*
27 BHI-00174, *U Plant Aggregate Area Management Study Technical Baseline Report.*
28 80322-88-090, *Surface Contamination Investigation Report, Cross-Country Waste Transfer Line*, letter report from R. E. Wheeler to J. C. Bergam, Westinghouse Hanford Company, Richland, Washington.


*Waste Stream Type No:
1= Very Acidic.
2= High Salts/Very Basic.
3= Chelates/High Salt.
4= Low Salts/Near Neutral.

PUREX = Plutonium-Uranium Extraction (Plant or process).
RECUPLEX = Recovery of Uranium and Plutonium by Extraction (Plant or process).
SS = stainless steel.
VCP = vitrified clay pipeline.
WIDS = *Waste Information Data System* database.

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Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 200-W-7 | 200-W-7, 246-L, 241-S-TK-1, 243S-TK-1, 243-S-TK1, 200W Personnel Decontamination Facility catch tank, IMUST, Inactive Miscellaneous Underground Storage Tank | The site is located northwest of the 242-S Evaporator and just north of the MO-326 trailer. | 1978 to 1988 | Associated with the MO-0326 trailer. It was the personnel decontamination facility for the 200 West Tank Farms. | The underground tank is inside a chained area that measures approximately 3 by 3 m (9 by 9 ft), with three risers extending to the surface. The tank is posted with IMUST signs and radiological postings. | Catch Tank | none | 3 x 3 m (10 x 10 ft) | Waste contents would contain low levels of radionuclides. | none |
| 2 | 240-S-302 | 240-S-302, 240-S-302 Catch Tank, IMUST, Inactive Miscellaneous Underground Storage Tank | This unit is located north of the 202-S Building and east of the 240-S-151 Diversion Box. | 1950 to 1987 | Associated with the 240-S-151 Diversion Box. | This unit is a horizontal, cylindrical, steel tank. The 240-S-302 Catch Tank is buried underground to provide shielding from radiation. The tank is surrounded with posts and chain and is posted with radiological and IMUST signs. | Catch Tank | none | not available | Tank received leakage, spillage, line flushes, and drainage associated with waste transfers. In 1985, the tank was confirmed to be a leaker. Approximately 600 gal of rainwater were released between June 1985 and January 1986. | none |
| 3 | 241-A-302A | 241-A-302A, 241-A-302-A Catch Tank | The catch tank is located south of the east end of the 202-A Building and west of the 241-A-151 Diversion Box. It is located inside the PUREX security fence. | 1956 to ? | Associated with the 241-A-151 Diversion Box. | The unit is an underground, cylindrical vessel made of carbon steel. It sits inside a pump pit with a riser extending to the surface. It is surrounded with posts and chain and is marked with radiological signs. | Catch Tank | none | not available | 1996 waste estimated as 6418 L (1698 gal) | none |
| 4 | 241-B-302B | 241-B-302B, 241-B-302-B Catch Tank, 241-B-302, IMUST, Inactive Miscellaneous Underground Storage Tank | This catch tank is located north of the 241-B-154 Diversion Box, adjacent to the corner of 7th Street and Baltimore Avenue. | 1945 to 1985 | Associated with B Tank Farm and 241-B-154 Diversion Box. | This unit is an underground, horizontal carbon steel tank. The catch tank and the 241-B-154 Diversion Box are surrounded with post and chain. The surface of the area inside the chain has been covered with gravel and sprayed with gray weatherizing material. The site is marked with radiological and IMUST signs. | Catch Tank | none | not available | 1985 estimated volume of liquid as 16,027 L (4249 gal) and sludge as 2608 L (690 gal) | none |
| 5 | 241-BX-302B | 241-BX-302B, 241-BX-302-B Catch Tank, IMUST, Inactive Miscellaneous Underground Storage Tank | The 241-B-302B Catch Tank is located on the south side of the 221-B Building (near section 12), and northwest of 241-BX-154 Diversion Box. | 1948 to 1985 | Associated with 241-BX-154 Diversion Box and BX Tank Farm. | The buried tank is covered with gravel. It is surrounded with post and chain. The tank is marked with radiological and IMUST signs. | Catch Tank | none | not available | estimated residual volume of supernate as 355 L (94 gal) and sludge as 3591 L (950 gal) | none |
| 6 | 241-BX-302C | 241-BX-302C, 241-BX-302-C Catch Tank, IMUST, Inactive Miscellaneous Underground Storage Tank | The 241-BX-302C Catch Tank is located southeast of 241-BX -155 Diversion Box, between Atlanta Avenue and Baltimore Avenue. | 1948 to 1985 | Associated with the 241-BX-155 Diversion Box and BX Tank Farm. | This catch tank is a horizontal cylinder of direct buried carbon steel. It is inside a recently graveled URM area, related to the 241-BX-155 Diversion Box surface stabilization. The tank was not covered with extra gravel and is separately posted as a CA. The tank is marked with radiological and IMUST signs. | Catch Tank | none | not available | 1984 estimated volume of sludge as 2400 L (635 gal) and supernate as 862 L (228 gal) | none |
| 7 | 241-ER-311 | 241-ER-311, 241-ER-311 Catch Tank, 241-ER-311A Replacement Tank | The tank is located south of the B Plant, and west of Atlanta Avenue, inside the 241-ER-151 Diversion Box fence. | 1954 to 1991 | Associated with the 241-ER-311A Catch Tank, 241-ER-151, 241-ER-152, and 241-ER-153 Diversion Boxes, automatic liquid level sensors, leak detection, and a submersible pump. | The underground tank is located inside the 241-ER-151 Diversion Box locked chain link fence. The fence is posted as a CA and a URM area, and is labeled with IMUST signs. The placement of these structures within the fence is that the 241-ER-311 Catch Tank is the furthest south, nearest the chain link fence. The 241-ER-311A Catch Tank is located adjacent to the north side of the 241-ER-311 tank (in the middle of the three structures). The 241-ER-151 Diversion Box is north of the 241-ER-311A Catch Tank. | Catch Tank | UPR-200-E-84 | not available | not available | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 241-ER-311A | 241-ER-311A,<br>241-ER-311A Catch Tank,<br>old 241-ER-311,<br>original 241-ER-311 Catch Tank,<br>IMUST,<br>Inactive Miscellaneous Underground Storage Tank | This unit is below grade. The tank is located southwest of the B Plant. It is south of 7th Street and west of Atlanta Avenue. | 1950 to 1954 | Associated with the 241-ER-151 Diversion Box. | It is located within a chain link fence that is posted as a CA and a URM area, and is labeled with IMUST signs. The 241-ER-151 Diversion Box, the 241-ER-311 Catch Tank, and the 241-ER-311A Catch Tank all are located inside this chain link fence. The placement of these structures within the fence is that the 241-ER-311 Catch Tank is the furthest south, nearest the chain link fence. The 241-ER-311A Catch Tank is located adjacent to the north side of the 241-ER-311 Catch Tank (in the middle of the three structures). The 241-ER-151 Diversion Box is north of the 241-ER-311A Catch Tank. | Catch Tank | none | not available | not available | none |
| 9 | 241-EW-151 | 241-EW-151,<br>241-EW-151 Vent Station Catch Tank,<br>241-EW-151 Vent Station, Vent Station,<br>200 Area East-West Vent Station | The site is located south of Route 3, approximately halfway between the 200 East and West Areas. It is south of the 609-A Fire Station. | 1955 to ? | This site is part of the Cross-Site Waste Transfer System and is associated with Diversion Boxes 241-UX-154 (200 West) and 241-ER-151 (200 East). The vent station is associated with the cross-site transfer line that runs between Diversion Boxes 241-UX-154 (200 West) and 241-ER-151 (200 East). | The vent station is enclosed in a locked, chain link fence. It consists of an underground concrete structure containing a SS tank in a vault with a jumper pit above the tank. The tank has two vent risers that extend above grade and a riser for the unit's leak detection system. At the bottom of the stairwell access is a floor drain that connects to a nearby french drain. Several hazard and radiological warning signs are posted on the fence. Also, two areas outside the fence, adjacent to the northeast side of the vent station, are posted with URM area signs. | Catch Tank | UPR-600-20 | not available | not available | none |
| 10 | 241-TX-302B | 241-TX-302B,<br>241-TX-302-B Catch Tank,<br>IMUST,<br>Inactive Miscellaneous Underground Storage Tank | This tank is located east of the TX Tank Farm, northeast of the 241-TX-155 Diversion Box. | 1949 to 1982 | Associated with the 241-TX-155 Diversion Box, and 241-TX-302BR Catch Tank. | This unit is an underground cylindrical tank made of steel. The ground surface around the tank has been covered with gravel. The tank is surrounded with light posts and chain and is posted with CA and IMUST signs. | Catch Tank | UPR-200-W-131 | not available | 1984 estimated volume waste as 4987 L (1320 gal). | Tank sampled in 1984; reported dose rate of 24 mrad/h and pH 9.95 |
| 11 | 241-TX-302BR | 241-TX-302BR,<br>241-TX-302BR Catch Tank,<br>241-TXR-302BR,<br>IMUST,<br>Inactive Miscellaneous Underground Storage Tank | The 241-TX-302BR Catch Tank is located east of the 241-TX-155 Diversion Box. It is located east of Camden Avenue and south of 23rd Street. | 1950 to 1954 | Associated with UPR-200-W-131, 241-TX-155 Diversion Box, 241-TX-302B Catch Tank, and 216-T-20 Acid Pit. | This unit is an underground horizontal, cylindrical tank made of steel. The ground surface around the tank has been covered with gravel. The tank is surrounded with posts and chain and is labeled with IMUST signs. | Catch Tank | none | not available | not available | none |
| 12 | 241-TX-302C | 241-TX-302C,<br>241-TX-302-C Catch Tank | The 241-TX-302 Catch Tank is located southeast of the center of the 221-T Building. | 1949 to ? | Associated with the 241-TX-154 Diversion Box. | This unit is an underground horizontal, cylindrical tank made of carbon steel. The tank area has been sprayed with shotcrete to control surface contamination. | Catch Tank | UPR-200-W-38 | not available | not available | none |
| 13 | 240-S-151 | 240-S-151,<br>240-S-151 Diversion Box | The 240-S-151 Diversion Box is located north of the 202-S Canyon Building. | 1950 to 1987 | Associated with the 240-S-302 Catch Tank, UPR-200-W-82, and S Tank Farm. | This unit is constructed of reinforced concrete and is rectangular. The 240-S-151 Diversion Box has been weather covered. | Diversion Box | UPR-200-W-82 | not available | not available | none |
| 14 | 240-S-152 | 240-S-152,<br>240-S-152 Diversion Box | The 240-S-152 Diversion Box is located north of the 202-S Canyon Building. | 1977 to 1980 | Associated with 240-S-302 Catch Tank and S Tank Farm. | This unit is constructed of reinforced concrete and is rectangular. The 240-S-152 Diversion Box has been weather covered. | Diversion Box | none | not available | not available | none |
| 15 | 241-A-151 | 241-A-151,<br>241-A-151 Diversion Box | The diversion box is located south of the east end of the 202-A Building. | 1956 to ? | Associated with 241-A-302-A Catch Tank, A and AX Tank Farms. | The site is a reinforced concrete structure with cover blocks. Most of the structure is below grade. It is marked and radiologically posted. | Diversion Box | UPR-200-E-25,<br>UPR-200-E-26,<br>UPR-200-E-31,<br>UPR-200-E-42,<br>UPR-200-E-65 | not available | Multiple UPRs. Highly concentrated process wastes have contaminated the inside of the diversion box. | none |
| 16 | 241-B-154 | 241-B-154,<br>241-B-154 Diversion Box | The unit is located east of 221-B, at the intersection of Baltimore Avenue and 7th Street. | 1945 to 1984 | Associated with B Plant, 241-B-302 Catch Tank, 241-B-151, 241-B-152, and 200-E-116. | The site is a diversion box that interconnects the 241-B-151 and 241-B-152 Diversion Boxes with the 221-B Building. The unit is a rectangular, reinforced concrete structure. It was sprayed with gray, weatherizing foam. Later, a layer of shotcrete was placed over the diversion box, extending beyond the structure to include the surrounding ground surface. | Diversion Box | UPR-200-E-45,<br>UPR-200-E-77 | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 241-BX-154 | 241-BX-154, 241-BX-154 Diversion Box | This Diversion Box is located south of the 221-B Building and east of the 241-BX-302B Catch Tank. | 1948 to 1985 | Associated with the 241-BX-302-B Catch Tank and the BX Tank Farm. This unit interconnects the 241-B-252 and 241-BX-155 Diversion Boxes and the 221-B Building. | This diversion box is a reinforced concrete structure. | Diversion Box | UPR-200-E-77 | not available | not available | none |
| 18 | 241-BX-155 | 241-BX-155, 241-BX-155 Diversion Box | This Diversion Box is located northeast of B Plant on the south side of Atlanta Avenue. | 1948 to 1984 | Associated with the 241-BX-302-C Catch Tank and the BX Tank Farm. | This diversion box is a reinforced concrete structure. The diversion box has been isolated and covered with waterproof foam sealant. The area around the diversion box has been surface stabilized with gravel and posted with URM area signs, except for the surface area above the 241-B-302-C Catch Tank. This area does not have the additional layer of gravel and remains posted as a CA. | Diversion Box | UPR-200-E-78 | not available | not available | none |
| 19 | 241-C-154 | 241-C-154, 241-C-154 Diversion Box | The Diversion Box is located south of 7th Street, southeast of the (demolished) 201-C Process Building and northeast of the 216-C-1 Crib. | 1946 to 1985 | Associated with the 201-C C-Cell, the B Plant Promethium Transfer Line (line V743), and 200-E-41 stabilized area. | The diversion box has been covered with clean backfill material (ash) and is no longer visible. It is located within the larger Hot Semiworks Facility surface stabilized area (200-E-41). | Diversion Box | none | not available | not available | none |
| 20 | 241-ER-151 | 241-ER-151, 241-ER-151 Diversion Box | The site is located southwest of the B Plant and near the corner of 7th Street and Atlanta Avenue. | 1945 to ? | Associated with the 241-ER-311 Catch Tank, the Cross-Site Transfer Line, 241-EW-151 Vent Station, the 244-BX Double Contained Receiver Tank, and the 241-ER-152, 241-ER-153, and 241-UX-154 Diversion Boxes and the 241-ER-311 Catch Tank. | The diversion box is located inside a locked chain link fence. The fence is posted with "Caution - contact Radiological Control and Tank Farm Shift Office prior to entry" signs. The diversion box is surrounded with a metal safety barricade. | Diversion Box | UPR-200-E-84, UPR-600-20 | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | September 1998 rad surveys detected up to 10,000 cpm on contaminated specks and 25,000 cpm on ant hill. |
| 21 | 241-ER-152 | 241-ER-152, 241-ER-152 Diversion Box | This 241-ER-152 Diversion Box is southeast of the 224-B Building, and east of 241-ER-151 Diversion Box, near the corner of Atlanta Avenue and 7th Street. | 1945 to ? | Associated with the 241-ER-151 and 241-ER-153 Diversion Boxes, the 241-ER-311 Catch Tank, and transfer lines. It is also associated with the stabilized contamination know as 200-E-29. | Most of the reinforced concrete diversion box structure is underground. The floor and lower portions of the walls are lined with SS. Cover blocks with lifting hooks are visible from the surface. The 241-ER-152 Diversion Box is surrounded with radiation rope and CA signs. | Diversion Box | none | ~540 $m^2$ (6000 $ft^2$); in 1996, contamination spread over an area measuring approximately 0.5 ha (1.2 ac) | not available | none |
| 22 | 241-TX-152 | 241-TX-152, 241-TX-152 Diversion Box | This unit is located east of the TX Tank Farm. It is east of Camden Avenue and south of 23rd Street. It is north of the 200 West Area Powerhouse pond. | 1949 to ? | Associated with the T Plant, SY Tank Farm, UPR-200-W-113, and the 241-TX-154 Diversion Box. | The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. A few inches of the structure that extend above ground are covered with a gray weather coating. It is surrounded with light posts and chain and is posted with various radiological postings. | Diversion Box | none | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |
| 23 | 241-TX-154 | 241-TX-154, 241-TX-154 Diversion Box | This unit is located on the east side of the 221-T Building. | 1949 to ? | Associated with T Plant operations, 241-TX-152 Diversion Box, 241-TX-302C Catch Tank, and SY Tank Farm. | The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. The diversion box is surrounded with post and chain. It is labeled and radiologically posted. The adjacent area has been covered with shotcrete. | Diversion Box | UPR-200-W-21, UPR-200-W-38, UPR-200-W-40, UPR-200-W-160 | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |
| 24 | 241-TX-155 | 241-TX-155, 241-TX-155 Diversion Box | This unit is located east of the TX Tank Farm, south of 23rd Street and north of the 200 West Area Powerhouse pond. | 1949 to 1980 | Associated with the 241-TX-302B and 241-TX-302BR Catch Tanks, and the T, TX, and TY Tank Farms. | The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. A few inches of the structure that extends above ground are covered with a gray weather coating. It is surrounded with light posts and chain and CA signs. | Diversion Box | UPR-200-W-5, UPR-200-W-28, UPR-200-W-76, UPR-200-W-113, UPR-200-W-131, UPR-200-W-160 | 9 x 30.5 m (in 1954) | Multiple releases documented, including contaminated nitric acid solution in 1952. Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 241-U-151 | 241-U-151,<br>241-U-151 Diversion Box | The 241-U-151 Diversion Box is located northeast of the intersection of Camden Avenue and 16th Street, east of the U Tank Farm. | 1946 to ? | Associated with the 241-U-301 Catch Tank and the 244-S and 244-TX Double Contained Receiver Tanks. The unit also is associated with the 241-U-152 and 241-TX-152 Diversion Boxes. | The diversion box is marked and radiologically posted. This unit is constructed of reinforced concrete with multiple encased liquid waste transfer lines. The diversion box structure is mostly below ground. It has three layers of cover blocks. | Diversion Box | UPR-200-W-6 | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |
| 26 | 241-U-152 | 241-U-152,<br>241-U-152 Diversion Box | The 241-U-152 Diversion Box is located northeast of the intersection at Camden Avenue and 16th Street, east of the U Tank Farm. | 1946 to ? | The 241-U-152 Diversion Box is associated with the 241-U-301 Catch Tank, and 241-U-153 Diversion Box. | The diversion box is marked and radiologically posted. The unit is constructed of reinforced concrete with multiple encased liquid waste transfer lines. The diversion box structure is mostly below ground. It has three layers of cover blocks. | Diversion Box | UPR-200-W-6 | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |
| 27 | 200-W-125 | 200-W-125,<br>216-Z-1 Ditch replacement pipeline | The pipeline extends east from the 231-Z Building and turns south to connect with the head end of the 216-Z-11 Ditch. | not specified | Associated with 216-Z-1 Ditch, 216-Z-11 Ditch, and the 231-Z Building. | The site is an underground buried pipeline. The pipeline is a 0.46 m (18 in.) diameter VCP. | Radioactive Process Sewer | none | not available | not available | none |
| 28 | 200-W-16 | 200-W-16,<br>292-T underground tanks, IMUST, Inactive Miscellaneous Underground Storage Tank,<br>292-TK-1, 292-TK-2 | The underground tanks are near the southeast corner of the 292-T Building addition. The 292-T Building is south of the 291-T Stack and north of the 222-T Building. | 1944 to 1970 | Associated with 291-T, 221-T, and the 292-T facility (200-W-40). | Two metal riser pipes extend about 0.5 m (1.5 ft) above grade near the southeast corner of the 292-T Building addition. Both are capped and one appears to have a pressure relief vent. These pipes extend from two buried tanks (292-TK-1 and 2). A chain link fence encloses the area where the tanks are located. The fence is posted with Access Restricted signs. The site is within a chained area posted "Contamination Area." | Storage Tank | none | not available | Unknown quantity of material placed into tanks. | Rad survey done in 1995 revealed a 2 mrem/h dose rate above the tanks. |
| 29 | 200-E-111-PL | 200-E-111-PL,<br>encased pipeline from 241-ER-151 Diversion Box to C Tank Farm and 244-AR Vault,<br>3-38 encasement,<br>V108/V837/8618/8653/8901 PAS | The encased pipeline runs eastward from the 241-ER-151 Diversion Box, south of 7th Street, and branches off in two directions (forming a "Y") at a point southeast of the 216-C-10 Crib. From the "Y," it branches to the C Tank Farm and the 244-AR Vault. | 1952 | Waste transfer encasement connected to the 241-ER-151 Diversion Box, 241-ER-152 Diversion Box, 241-CR-151, C Tank Farm, and the 244-AR Vault. | The site is an underground piping encasement that contains three 7.5 cm (3 in.)-diameter, stainless-steel waste transfer pipelines, numbered "V108," "8618," and "8653," which run from the 241-ER-151 Diversion Box through a "Y" that branches to the C Tank Farm and the 244-AR Vault. The section from the "Y" junction to the 244-AR Vault contains two 7.5 cm (3-in.) pipelines numbered "809" and "818." There is a posted CA on top of the line at the "Y" junction where the line branches to the C Tank Farm and the 244-AR Vault. The entire length of the pipeline is marked with steel fence posts and posted as a URM area. The ground surface above the pipeline is bare in spots; other sections are vegetated with crested wheatgrass, tumbleweeds, and native grass species. | Tank Farm Process Piping | UPR-200-E-86 | not available | not available | May 2000 rad survey found growing tumbleweeds at swab riser; contamination levels measured up to 2000 dpm beta/gamma. |
| 30 | 200-E-116-PL | 200-E-116-PL,<br>pipelines from 241-B-154 Diversion Box to 241-C-151 and 241-C-152 Diversion Boxes,<br>direct buried pipeline,<br>V111/V210/V130 | The site is located north of and runs parallel to 7th Street, between B Plant and the C Tank Farm in 200 East Area. | not specified | B Plant, 241-B-154 Diversion Box, 241-C-151 Diversion Box, 241-C-152 Diversion Box, and C Tank Farm. | The pipeline is posted as "Underground Radioactive Pipeline," which extends from the 241-B-154 Diversion Box to the 241-C-151 and 241-C-152 Diversion Boxes. Vegetation over the pipeline has been crushed by vehicle traffic. An area located just north of the 241-B-154 Diversion Box was posted as a High CA in September 2000, but was covered with a biobarrier and gravel in February 2001. It is now a rectangular posted URM area over a portion of the pipeline. Another area of contamination was found on this pipeline in June 2001. This area was covered with gravel and posted as a URM in August 2001. | Tank Farm Process Piping | UPR-200-E-82 | not available | radioactive mixed waste | In September 2000, rad survey revealed contamination levels to 50,000 cpm. In June 2001, rad survey found contamination levels in vegetation adjacent to the area with up to 50,000 cpm. |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 200-W-78 | 200-W-78, pipeline between TX/TY and T Tank Farms, encased pipeline | The underground line is located in 200 West Area between the T and TX/TY Tank Farms, on the west side of Camden Avenue. | 1944 | Associated with T and TX Tank Farms. UPR-200-W-167 also was located in the vicinity of this pipeline. | The site is an encased, underground pipeline that runs between the 241-TXR-151 Diversion Box in the TX Tank Farm and the 241-TR-153 Diversion Box in the T Tank Farm. Outside the tank farm fence, the line is marked with "Radioactive Pipeline" signs. There are several stabilized, individually radiologically posted areas on top of (or adjacent to) this pipeline, near the east side of the TY Tank Farm perimeter fence. | Tank Farm Process Piping | UPR-200-W-167 | 3 m x 14 m (10 ft x 45 ft) | not available | Evidence of contaminated biological intrusion above the line. Difficult to determine which line is source of the contamination. April 2001 rad survey detected soil contamination up to 4000 cpm. |
| 32 | 200-W-97 | 200-W-97, encased pipeline from 240-S-151 Diversion Box to 241-S-151 Diversion Box | The pipeline extends northwest from the REDOX facility to the S/SX Tank Farms. | not specified | Associated with 202-S, 203-S, 204-S, and 205-S and the 241-S-151 Diversion Box. | The site is an underground concrete-encased pipeline. The surface is marked with Underground Radioactive Material – Pipeline signs. Yellow swab risers are located along the pipeline. One swab riser, near the 204-S Facility, has been surrounded with posts and chain and is posted with Soil Contamination Area signs. | Tank Farm Process Piping | none | 2.4 x 2.4 m (8 x 8 ft) | Soil contamination area located on the underground pipeline. | October 2001: rad survey detected up to 20,000 cpm on tumbleweed fragments and soil. |
| 33 | 200-W-98 | 200-W-98, encased pipeline from 240-S-151 to 241-U-153 Diversion Box, V458,V459,V460 | The pipeline is located south of 16th Street, extending in a southeast direction from the 241-U-153 Diversion Box to 204-S and the REDOX Facility. | not specified | Associated with the 204-S Facility and the 241-U-153 Diversion Box. | The site is a cement-encased underground pipeline. The pipeline is marked with Underground Radioactive Material – Pipeline signs. | Tank Farm Process Piping | none | not available | not available | none |
| 34 | 200-W-99 | 200-W-99, encased pipeline from 241-U-151 to 241-S-151 Diversion Boxes | The pipeline is located south of 16th Street, extending from the 241-U-151 Diversion Box to the 241-S-151 Diversion Box. | not specified | | The site is a cement-encased underground pipeline. The pipeline is marked with Underground Radioactive Material – Pipeline signs. | Tank Farm Process Piping | none | not available | not available | none |
| 35 | 200-W-100 | 200-W-100, Encased Pipeline from 241-UX-154 to 241-SX-152 Diversion Box, lines 4700, 4701, 4853, V762, V503 and V505 | The pipeline begins on the east side of the 221-U Building and extends in a southwest direction to terminate at the 241-SX-152 Diversion Box, located on the east side of the S/SX Tank Farms. | not specified | | The site is a cement-encased underground pipeline. The pipeline is marked with Underground Radioactive Material – Pipeline signs. | Tank Farm Process Piping | none | not available | not available | In 1998, ground-penetrating radar scans in the area revealed 44 linear anomalies. |
| 36 | 200-W-105 | 200-W-105, encased transfer line between 241-UX-154 Diversion Box and TX Tank Farm | The pipeline begins on the east side of the 221-U Building and extends in a northwest direction to terminate at the 241-TX-155 Diversion Box. The line continues through the Diversion Box to the TX Tank Farm. | 1946 | The encasement includes tank farm lines V-375, V-382, and 4859/4703. | The site is a cement-encased underground pipeline. The pipeline is marked with Underground Radioactive Material – Pipeline signs. | Tank Farm Process Piping | none | not available | not available | In 1998, ground-penetrating radar scans in the area revealed 44 linear anomalies. |
| 37 | UPR-200-E-1 | UPR-200-E-1, waste line failure on south side of 221-B | The release occurred on the south side of the 221-B Building. | The release occurred in September 1946 | B Plant | The UPR is not separately marked or posted. | Unplanned Release | UPR-200-E-80 | not available | The original line break was waste from the metal waste line. | In 1946, area was covered to reduce surface readings to 2 mrad/h. |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | UPR-200-E-3 | UPR-200-E-3, line leak from 221-B to 241-BX-154, UN-200-E-3 | The release occurred on the south side of 221-B, between the 221-B Building and 241-BX-154. | 1951 – The exact date of the occurrence is unknown. | B Plant | The release is not separately marked or posted. | Unplanned Release | none | not available | The release consisted of B Plant first-cycle waste. | Excavation efforts abandoned when readings of 120 rad/h found with 18 in. soil remaining over pipeline. |
| 39 | UPR-200-E-42 | UPR-200-E-42, 241-AX-151 Release, UN-200-E-42 | The 241-AX-151 Diversion Box is located near the corner of 4th Street and Buffalo Avenue, adjacent to the 204-AR Unloading Station. The UPR site included a dirt bank east of the 241-AX-151 Diversion Box and weeds east of the established parking lot. | 1972 to ? | Associated with 241-AX-151 Diversion Box and 244-AR Vault. | A WIDS sign has been placed near the diversion box structure to document the release. | Unplanned Release | none | not available | not available | In 1972, contamination of up to 300 mrad/h with spots to 20 rad/h was found. The blacktop east of the diversion box was contaminated up to 3,000 cpm. The dirt bank had contamination up to 2,000 cpm and weeds contaminated 300 to 800 cpm. |
| 40 | UPR-200-E-44 | UPR-200-E-44, UN-200-E-44, B Plant Condensate Steam Waste Line Leak South of 221-B | The UPR occurred south of 221-B, near the R-17 change house, north of 7th Street. The change house no longer exists. | The release occurred in August 1972. | Associated with B Plant. | The release site is not separately marked or posted. There is no visual evidence of the area that caved in. | Unplanned Release | UPR-200-E-103 | 0.30 m (1.00 ft) in diameter | not available | Soil removed from excavation was contaminated up to 20,000 cpm. Dose rate on pipe was up to 20 mrad/h. |
| 41 | UPR-200-E-45 | UPR-200-E-45, UN-200-E-45, contamination spread from the 241-B-154 Diversion Box | The 241-B-154 Diversion Box is located at the corner of 7th Street and Baltimore Ave. The release involved loose contamination spreading in a southeasterly direction from the 241-B-154 Diversion Box. | 1974 | This release is related to the 241-B-154 Diversion Box. | A large area on the northeast corner of 7th Street and Baltimore Avenue is surrounded with post and chain and is marked as a URM area. The URM surrounds the 241-B-154 Diversion Box, which has been covered with a coating of gray grout. The original UPR is not separately marked or posted. | Unplanned Release | UPR-200-E-77 | Approximately 91.5 x 30.5 m (300 x 100 ft) | Contaminated particles (specks) spread from inside diversion box. | Ground surface contamination up to 50,000 cpm and up to 30,000 cpm on blacktop. |
| 42 | UPR-200-E-77 | UPR-200-E-77, UN-216-E-5, 241-B-154 Diversion Box Ground Contamination, UN-200-E-77 | This site is located east of 221-B Building, at the northeast corner of Baltimore Avenue and 7th Street. It surrounds the 241-B-154 Diversion Box. | 1946 to ? | Site associated with the 241-B-154 Diversion Box. | A large graveled area on the northeast corner of 7th Street and Baltimore Avenue is surrounded with post and chain and is marked as a URM area. The URM surrounds the 241-B-154 Diversion Box, which has been covered with a coating of gray grout. The area appears to have been posted in stages. A large posted oval area (URM) extends north and east from the diversion box. Another posted area (URM) extends west to Baltimore Ave. and turns northward. In January 2000, a separate CA was posted around a power pole (adjacent to a manhole) within the larger URM. In 2002, the posting around the power pole was removed and a Fixed Contamination Area sign was attached to the pole. | Unplanned Release | none | 125 x120 m (410 x 394 ft) | Original release involved metal waste solution from 221-B Building with about 1 Ci fission products. | 1975 rad survey found surface contamination up to 80,000 cpm. |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | UPR-200-E-78 | UPR-200-E-78, UN-216-E-6, 241-BX-155 Diversion Box ground contamination, UN-200-E-78 | This site is located in the area around the 241-BX-155 Diversion Box, south of the BX Tank Farm, northeast of B Plant between Atlanta and Baltimore Avenues. | 1955 to ? | | The diversion box has been isolated and covered with gray grout. The area around the diversion box and the surface area above the 241-B-302-C Catch Tank have been surface stabilized with gravel and posted with URM area signs. | Unplanned Release | none | 18 $m^2$ (200 $ft^2$) area | Contaminated ground. Release involved salt-containing waste from B Plant with about 10 Ci of fission products. | At the time of the release, the maximum dose rate was 22.6 rad/h. |
| 44 | UPR-200-E-80 | UPR-200-E-80, UN-216-E-8, 221-B R-3 Line Break, R-3 Radiation Zone, UN-200-E-80 | The release occurred in an underground pipeline, located on the south side of the 221-B Canyon Building, near the R-3 stairwell. The leak resulted in a contaminated area measuring 30 m (100 ft) wide by 152 m (500 ft) in length, along the south side of the 221-B building. | The release occurred in June 1946. | Associated with an underground metal waste line from the 221-B Canyon Building. | The UPR is not separately marked or posted. | Unplanned Release | UPR-200-E-1 | 30 m (100 ft) wide by 152 m (500 ft) in length | Release of about 10 Ci of fission products from metal waste pipeline. | In 1946, the dose rate at ground surface was 400 rad/h. After covering, the dose rate was reduced to 100 mrad/h. |
| 45 | UPR-200-E-84 | UPR-200-E-84, 241-ER-151 Catch Tank Leak, UN-200-E-84, UN-216-E-12 | The release occurred adjacent to the 241-ER-151 Diversion Box, southwest of the 221-B Building. | 1953 | Associated with 241-ER-311 Catch Tank and 241-ER-151 Diversion Box. | The 241-ER-151 Diversion Box and the 241-ER-311 Catch Tank are located inside a chain link fence that is radiologically posted. A WIDS sign has been placed at the approximate location of the release. | Unplanned Release | none | not available | Contaminated acid with about 10 Ci of fission products. | In 1975, surface contamination was up to 90,000 cpm. |
| 46 | UPR-200-E-85 | UPR-200-E-85, Line Leak at 221-B Stairwell R-13, UN-216-E-13, UPR-200-E-41, UN-200-E-85, UN-200-E-41 | UPR-200-E-85 occurred south of the center of the 221-B Building, near the R-13 utility pit. | The release occurred in July 1972. | Associated with the (unencased transfer line from the) 18-1 Tank in the 221-B Building, the 241-BX-154 Diversion Box, and the R-13 Utility Pit. This occurrence also was given the number UPR-200-E-41. | The site was stabilized in 1984 and posted with URM area signs. The release site is not labeled. The R-13 Utility Pit was covered with a steel lid. | Unplanned Release | none | 15.24 x 15.24 m (50 x 50 ft) | The waste line contained ion exchange waste from tank 18-1, located inside the B Plant canyon. Soil samples collected in 1972 identified the release as predominantly Cs-137. Approximately 30 Ci of cesium were released, but half of the release was removed with the soil that was excavated to expose the line leak. | 15 rad/h, 2 in. from the source. |
| 47 | UPR-200-E-87 | UPR-200-E-87, UN-216-E-15, 224-B South Side Plutonium Ground Contamination, UN-200-E-87, 216-E-15 | The UPR-200-E-87 site is located on the south side of the 224-B Building in the 200 East Area. | 1945 to 1953; no confirmed release occurred | Associated with the underground pipelines at the 224-B Building. | Some areas on the south side of 224-B are posted with URM area signs. The release site is not specifically marked. | Unplanned Release | UPR-200-W-102 | not available | About 75 g (3 oz) Pu-239 may have leaked into the soil. | 1975 rad survey reported no detectable contamination. |
| 48 | UPR-200-E-96 | UPR-200-E-96, Ground Contamination SE of PUREX, UN-216-E-24, UN-200-E-96 | The release site includes contaminated areas on the south and east sides of PUREX. | N/A | Associated with 200-E-103, 200-E-107, the 291-A Stack, and the 241-A-151 Diversion Box. | The site was described in 1980 as an area measuring approximately 1.0 ha (2.5 acres) located adjacent to the east and south sides of 202-A (PUREX). These areas are now covered with gravel and posted as URM areas. | Unplanned Release | none | Approximately 1 ha (2.5 ac) | Contamination consisted of low-level particles | none |
| 49 | UPR-200-W-2 | UPR-200-W-2, UN-200-W-2, Underground Waste Line Leak | The cave-in occurred on the southeast side of the 221-T Facility, near stairwell R-19. | June 1947 | Associated with 221-T. | The area around stairwell R-19 at the 221-T facility currently is paved with asphalt. A long, narrow URM area is posted around the R-19 area. | Unplanned Release | UPR-200-W-98 | not available | Mixed process effluent | none |
| 50 | UPR-200-W-5 | UPR-200-W-5, overflow at 241-TX-155, UN-200-W-5 | The site consists of the 241-TX-155 Diversion Box and the adjacent hillside to the west. The diversion box is located east of Camden Avenue, east of the TX Tank Farm. | 1950 | Associated with the 241-TX-155 Diversion Box. | In 2000 and 2001 multiple areas of soil and vegetation contamination were identified, and all were posted. For consolidation purposes, all of the new CAs were recorded and mapped as UPR-200-W-113. A WIDS sign has been placed at the approximate location of the release. | Unplanned Release | UPR-200-W-28, UPR-200-W-113, UPR-200-W-131 | not available | Contaminated soil | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | UPR-200-W-6 | UPR-200-W-6, UN-200-W-6, contamination spread from 241-U-151 and 241-U-152 Diversion Boxes | The contamination spread occurred at the 241-U-151 and -152 Diversion Boxes, located east of the U Tank Farm, near the corner of 16th Street and Camden Avenue. | 1950 to ? | Associated with the 241-U-151 and 241-U-152 Diversion Boxes. | The ground around the 241-U-151 and the 241-U-152 Diversion Boxes has been covered with gravel. The diversion boxes are marked and posted. A WIDS sign has been placed at the approximate location of the release. | Unplanned Release | none | not available | Ground contamination from diversion boxes | Maximum dose rate of 20 mrad/h on the surface of the soil. |
| 52 | UPR-200-W-28 | UPR-200-W-28, Release from 241-TX-155 Diversion Box, UN-200-W-28 | The release site is located adjacent to the 241-TX-155 Diversion Box, approximately 244 m (800 ft) east of the TX Tank Farm and north of the 200 West Area Powerhouse Pond. | 1954 to ? | Associated with the 241-TX-155 Diversion Box. | The documented contaminated area was found at the 241-TX-155 Diversion Box. There is a large posted URM area west of the diversion box and several smaller radiologically posted areas in this vicinity (see UPR-200-W-113 and UPR-200-W-135). The diversion box has been isolated and weather covered and is marked and posted with various radiological control signs. A WIDS sign has been placed at the approximate location of the release. | Unplanned Release | UPR-200-W-5, UPR-200-W-113, UPR-200-W-131, UPR-200-W-135 | 9.1 x 30.5 m (30 x 100 ft) | Contaminated soil | In 1970, soil samples reported less than detectable contamination. Over the years, contaminated vegetation, animal feces, and soil specks periodically have been identified. |
| 53 | UPR-200-W-29 | UPR-200-W-29, transfer line leak, UN-200-W-29, UPR-200-W-27 | The site is located at the southeast corner of the intersection of Camden Street and 23rd Street. The release site is located adjacent to the 241-TX-155 Diversion Box, approximately 244 m (800 ft) east of the TX Tank Farm and north of the 200 West Area Powerhouse pond. | 1954 to ? | Associated with the 241-T-152 Diversion Box. | The area is currently surrounded with steel posts, covered with gravel, and posted as a URM area. | Unplanned Release | UPR-200-W-64, UPR-200-W-97 | 30.5 x 22.9 m (100 x 75 ft) | Less than 3800 L (1000 gal) estimated to have escaped. | Contaminated soil with a maximum dose rate of 11.5 rad/h at a distance of 5 cm (2 in.) over waste run-off area and up to 4.5 rad/h at 0.9 m (3 ft) near the cave-in. February 1998 rad survey detected no surface contamination. |
| 54 | UPR-200-W-32 | UPR-200-W-32, UNH transfer line break, UN-200-W-32 | The release occurred near the northwest corner of the REDOX Plant. | The release occurred in 1954. | 204-S Facility | The release site is not currently marked or posted. The aboveground pipeline has been removed. | Unplanned Release | none | not available | An unknown amount of UNH | none |
| 55 | UPR-200-W-35 | UPR-200-W-35, Ground Contamination Near UNH Process Line, UN-200-W-35, REDOX to 224-U UNH Line Leak | The site was located along the aboveground UNH process line that ran from REDOX to U Plant, at a location just outside and to the north of the REDOX exclusion area. | The release occurred in September 1955. | 204-S Facility | Much of the area north of REDOX has been surface stabilized. The UPR site is not marked or posted. | Unplanned Release | none | not available | An unknown amount and concentration/activity of UNH solution | none |

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| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 56 | UPR-200-W-38 | UPR-200-W-38,<br>Line Break at 241-TX-302C,<br>UPR-200-W-160,<br>UPR-200-W-40,<br>UN-200-W-38,<br>216-T-30 | The release occurred on the southeast side of T Plant (221-T), between the 241-TX-154 Diversion Box and the 241-TX-302 Catch Tank. The liquid release affected a large area between the 221-T and 222-T buildings. The release site is located adjacent to the 241-TX-155 Diversion Box, approximately 244 m (800 ft) east of the TX Tank Farm and north of the 200 West Area Powerhouse Pond. | 1955 | Release associated with 241-TX-154 Diversion Box and 241-TX-302C Catch Tank. UPR-200-W-21 occurred in the same vicinity in 1953. | The area around the 241-TX-154 Diversion Box and the catch tank has been stabilized with sprayed concrete (shotcrete). The area is posted with URM area signs. A WIDS sign has been placed at this location. | Unplanned Release | UPR-200-W-21 | Approximately 139.35 $m^2$ (1500 $ft^2$). Cleanup activities increased the contaminated area to approximately 371.6 $m^2$ (4000 $ft^2$). | Contaminated with radioactive metal waste solution that is high salt and neutral to basic. Estimated volume of up to 19,000 L (5026 gal). | In 1968, the maximum dose rate encountered through backfill was 500 mrad/h. NOTE: It is reported that a hose with 33 rad/h contamination was buried in the backfill over the area. |
| 57 | UPR-200-W-64 | UPR-200-W-64,<br>Road Contamination at 23rd and Camden,<br>UN-200-W-64 | The release is located between the east shoulder of Camden Avenue and the posted URM area (UPR-200-W-29/UPR-200-W-97), near the corner of 23rd Street and Camden Avenue. | 1969 to ? | UPR-200-W-29 and UPR-200-W-97 are the apparent source of contamination for this release. | The corner of 23rd Street and Camden Avenue has been stabilized with clean gravel because of two waste line leak events. The stabilized area is surrounded with chain and posted with URM area signs. The road shoulders are not posted. A WIDS sign has been placed at the approximate location of the release. | Unplanned Release | UPR-200-W-29, UPR-200-W-97 | Approx. 15.4 x 0.6 m (50 x 2 ft) strip bordering Camden Avenue at its intersection with 23rd Street | Cs-137 was the only detectable radioactive isotope; source appears to be rain water runoff from adjacent UPR areas. | In 1969, contamination up to 600 cpm was reported. |
| 58 | UPR-200-W-97 | UPR-200-W-97,<br>Transfer Line Leak,<br>UN-216-W-5,<br>UN-200-W-97 | The release occurred southeast of the T Tank Farm at the corner of 23rd Street and Camden Avenue. | 1966 | Associated with the underground pipeline connecting 241-T-152 Diversion Box and the 241-TX-153 Diversion Box. It occurred at the same location as UPR-200-W-29 and adjacent to UPR-200-W-64. The site is associated with UPR-200-W-29, because a repeat release from the same broken transfer line (documented in UPR-200-W-29 in 1954) occurred again in 1966. | The site is located at the corner of 23rd Street and Camden Avenue. It is marked and posted as "Underground Radioactive Material." The release site was stabilized with clean soil, sand, ureabore herbicide, and crushed rock. | Unplanned Release | UPR-200-W-29, UPR-200-W-64 | 36.6 x 1.8 m (120 x 6 ft) | Waste was a high salt, neutral to basic solution; second-cycle bismuth phosphate waste from 241-T-107 Tank; leak estimated to contain about 10 Ci of fission products. | 1966 dose rate at bottom of 3 ft hole was 9 rad/h. 1990 rad survey detected subsurface contamination of 600 cpm, down from the 60,000 cpm reported in the 1978 survey. |
| 59 | UPR-200-W-98 | UPR-200-W-98,<br>UN-216-W-6,<br>221-T waste line break at R-19,<br>UN-200-W-98 | The release site is located near the southeast corner of the 221-T Canyon Building, at door R-19. | 1945 | Associated with underground pipelines near the R-19 section of the 221-T Canyon Building. | The area around door R-19 is paved with asphalt and posted as a URM area. There is no sign that specifically marks the area as a UPR site. | Unplanned Release | UPR-200-W-2 | not available | Approximately 10 Ci of high-salt, neutral-to-basic fission products | Maximum dose rate of 20 rad/h (in 1945) at 5 cm (2 in.). 1975 rad survey reported 500 cpm. In 1977, test holes cut to 4 ft in release area detected no rad contamination. |
| 60 | UPR-200-W-102 | UPR-200-W-102,<br>UN-216-W-12,<br>UN-200-W-102,<br>224-T Underground Line Leak | The UPR occurred adjacent to the south and east sides of the 224-T Building. | 1972 | Associated with underground process lines at the 224-T Building. | The east and south sides of the 224-T Building are covered with gravel. The area along the east side of the 224-T Building is posted as a URM area. | Unplanned Release | none | 15.24 x 3.66 m (50.0 x 12.0 ft) | The release consisted of alpha-laden moisture from process tank lines that contaminated the soil around the pipeline. An estimated 72 g of plutonium were contained in the contaminated soil that was removed when the leak was discovered. | August 2000 rad survey detected no contamination. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | UPR-200-W-113 | UPR-200-W-113, Soil Contamination East of the TX Tank Farm, UN-216-W-23, Contamination Areas Around 241-TX-155 Diversion Box, UN-200-W-113 | The site is an area east of the TX Tank Farm, on the east side of Camden Ave. Posted CAs are located west, south, north, and east of the 241-TX-155 and 241-TX-152 Diversion Boxes. | 1977 to ? | Associated with the 241-TX-155 and 241-TX-152 Diversion Boxes and associated underground pipelines going into and out of the diversion boxes. | The original contaminated area was surface stabilized in 1990 and is surrounded with concrete marker posts and posted as a URM area. In 1998, 1999, and 2000, additional surface contamination was identified adjacent to the surface stabilized area and on the north, south, east and west sides of the diversion boxes. CAs also have been identified on the surface of underground transfer lines associated with the 241-TX-155 Diversion Box. The additional CAs, also are considered a part of this site (UPR-200-W-113) and are marked with posts, chain, and CA and Soil Contamination Area signs. One small CA, southeast of 241-T (located on a transfer line to the diversion box) recently was stabilized with gravel and now is posted with URM area signs. | Unplanned Release | UPR-200-W-28, UPR-200-W-76, UPR-200-W-135 | not available | Multiple UPRs. Contaminated rabbit feces and low-level beta/gamma surface contamination. Source of contamination was subsurface. | August 1998 underground pipe rad survey detected up to 80,000 cpm.; October 1999 rad survey detected 20,000 cpm on rusty railroad rail. |
| 62 | UPR-200-W-114 | UPR-200-W-114, UN-216-W-24, Ground Contamination East of SX Tank Farm, UN-200-W-114 | UPR-200-W-114 was located east of the SX Tank Farm. | 1980 | Associated with multiple releases from operation activities in the SX Tank Farm, and the 241-SX-151 and 241-S-151 Diversion Boxes. Documented operational releases extending eastward from the tank farm include UPR-200-W-20, UPR-200-W-49, UPR-200-W-50, UPR-200-W-51, UPR-200-W-52, and UPR-200-W-82. | This site is no longer marked or posted. For many years, the release site had been a large area posted with a light chain and Surface Contamination Area signs. The 216-S-8 Trench and the 216-S-1 and the 216-S-2 Cribs were located within the larger contamination zone. The surface contamination was scraped up and consolidated into other nearby waste sites. The cribs were individually surface stabilized and reposted with URM area signs. | Unplanned Release | UPR-200-W-20, UPR-200-W-49, UPR-200-W-50, UPR-200-W-51, UPR-200-W-52, UPR-200-W-82 | 106.68 x 137.16 m (350.0 x 450.0 ft); about 4.8 ha (11.9 ac) | Waste consists of particulate matter. | none |
| 63 | UPR-200-W-131 | UPR-200-W-131, Release from 241-TX-155 | The release occurred near the 241-TX-155 Diversion Box, located east of Camden Avenue and east of the TX Tank Farm. | 1953 | Associated with the 241-TX-155 Diversion Box, the 241-TX-302 Catch Tank. | The 241-TX-155 Diversion Box and 241-TX-302B Catch Tank are surrounded with post and chain and CA signs. Clean gravel has been placed around the diversion box, and a sign has been added to the chain boundary, identifying this to be the location of UPR-200-W-131. | Unplanned Release | UPR-200-W-113 | not available | Multiple UPRs of dilute acidic waste solution. Contaminated rabbit feces and low-level beta/gamma surface contamination. Source of contamination was subsurface. | Ground contamination up to 25 rad/h at 0.6 m (2 ft). |
| 64 | UPR-200-W-135 | UPR-200-W-135, Release from 241-TX-155, UN-200-W-135 | The cave-in associated with UPR-200-W-135 was located approximately 46 m (150 ft) northwest of the 241-TX-155 Diversion Box. The diversion box is located east of Camden Avenue and east of the TX Tank Farm. | 1954 | Associated with the 241-TX-155 Diversion Box. | Three major encased transfer lines are associated with the 241-TX-155 Diversion Box. Many areas of contamination have been identified on these transfer lines during 1999, 2000, and 2001. UPR-200-W-113 is located on a transfer line directly west of the 241-TX-155 Diversion Box and is surrounded with concrete marker posts and URM area signs. An extension of UPR-200-W-113 is located northwest of the original area, surrounded with metal posts and chain, and posted with CA signs. A single metal post, labeled UPR-200-W-135, has been placed adjacent to the UPR-200-W-113 CA. | Unplanned Release | UPR-200-W-13 | 12.19 x 0.61 m (40 x 2 ft) | Estimated 1,000 gal of mixed waste. | Estimated 300 rad/h at a distance of 10 cm (4 in.). |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | UPR-200-W-161 | UPR-200-W-161, UN-216-W-35, UN-200-W-161 | The site is located east of the U Tank Farm, on the east side of Camden Ave. It extends northward from the corner of 16th Street and Camden Ave. and the 241-U-152 Diversion Box. | 1990 to ? | Associated with U Tank Farm. A tank farm pipeline is buried in this approximate location. | The site is a large radiologically controlled area posted with URM area signs. A WIDS number sign has been posted at this location. | Unplanned Release | none | 280 x 50 m (918.6 x 164 ft); approx. 0.77 ha (1.9 acres) | Windblown contaminated soil particles | The general contamination was 250 to 450 cpm; one area up to 8,000 cpm. 1990 soil sample results: 2,930 pCi/g strontium, 6.26 pCi/g Cs-137, 3.27 pCi/g plutonium, and 0.00000026 pCi uranium. 1990 rad survey detected up to 80,000 cpm. |
| 66 | UPR-200-W-164 | UPR-200-W-164, Overhead UNH Line Leak, UN-216-W-29 | UPR-200-W-164 affects the soil beneath the aboveground UNH pipeline that extended from 204-S to 224-U. The pipeline was attached to a steam line located north of 204-S. | The release occurred in 1952. | Associated with the aboveground UNH transfer line from the 204-S Storage Tanks to the 224-U Building. | The aboveground UNH line has been removed. The Radiation Area signs that surrounded the pipeline also were removed. A portion of the site was interim stabilized in 1993. An area of contaminated soil found under the steam line, adjacent to the 216-S-9 Crib, was covered with clean soil and posted with "Underground Radioactive Material" warning signs. | Unplanned Release | none | not available | An unknown amount of UNH | none |
| 67 | UPR-200-W-167 | UPR-200-W-167, Contamination Migration from the TY Tank Farm, UN-216-W-32 | UPR-200-W-167 was located adjacent to the TY Tank Farm fence, extending east and north from the fence. | 1985 to ? | Associated with TY Tank Farm operations and WIDS sitecode 200-W-78. | The original release site, identified in 1985, was a Soil Contamination Area located adjacent to the east side of the TY Tank Farm. After the contamination was scraped and removed in 1986, the site was no longer marked or posted. Later, in 2000, three areas on the east and northeast sides of the TY Tank Farm (within the original boundaries of this UPR) were reposted as CAs. Contaminated ant hills and growing contaminated vegetation was found on top of a tank farm transfer line located outside the eastern tank farm fence (also see WIDS sitecode 200-W-78). In November 2000, the CAs were covered with biobarrier material and gravel. These areas were reposted with URM area signs. The underground radioactive pipeline is marked with posts and "Radioactive Pipeline" signs. The pipeline runs through the recently stabilized areas. | Unplanned Release | none | Approximately 192 m (630 ft) long and ranged from 42 m (140 ft) to 60 m (195 ft) wide; approximately 8,400 $m^2$ (90,000 $ft^2$) in an "L." | Radioactive contamination (specks) that migrated from TY Tank Farm; later, contaminated vegetation and ant hills found in this area. | 1987 and 1988 rad surveys reported no detectable contamination. |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | UPR-600-20 | UPR-600-20,<br>UN-216-E-41,<br>Cross Country Transfer Line Contamination,<br>Cross Site Transfer Line,<br>V360, V361 | The site extends from the 241-ER-151 Diversion Box in the 200 East Area to the 241-UX-154 Diversion Box in the 200 West Area. The majority of the transfer line is located in the 600 Area between the 200 East and West Areas, south of Route 3. The pipeline is approximately 2.3 miles long. | 1988 to ? | Associated with the 241-ER-151 Diversion Box (east end of the pipeline), the 241-EW-151 Vent Station (along middle of pipeline), and the 241-UX-154 Diversion Box (west end of the pipeline). | The underground transfer line extends from the U Plant in the 200 West Area to the 241-ER-151 Diversion Box in the 200 East Area. The site includes the contaminated soil and vegetation located on the surface of the cross site transfer line, as well as the pipeline itself. The surface of the underground line has been stabilized and currently is posted with "Underground Radioactive Materials" signs. There also is a large mound of soil, located south of the 241-EW-151 Vent Station, that is associated with the original transfer line surface stabilization activities. The soil mound is posted with URM area signs. | Unplanned Release | none | 4,828 x 15.2 m (15,840 x 50 ft) | Contaminated pipe, any subsurface leaks, and associated surface and vegetation contamination. Contaminated soil contained Cs-137, Pu-239/240, Sr-90, and uranium. | Contamination levels to 750 mrem/h. In 1988, eight boreholes were drilled at four locations along transfer line to characterize integrity. No contamination was found to have leaked below pipeline encasement, but contaminated sagebrush was found next to encasement (indicating that roots penetrated the encasement); June 2000 rad survey detected 30,000 cpm on ant mound. |
| 69 | UPR-200-W-82 | UPR-200-W-82,<br>contamination spread at 240-S-151 | The contamination spread was located on the north and east sides of the 240-S-151 Diversion Box and the 240-S-302 Catch Tank, on the north side of the REDOX facility (202-S). | 1980 | Associated with the 240-S-151 Diversion Box and the 240-S-302 Catch Tank. | | Unplanned Release | none | Approximately 186 $m^2$ (610 $ft^2$) | not available | none |
| 70 | 200-W-58 | 200-W-58,<br>Z-Plant Diversion Box #1 | Z Plant Diversion Box #1 is located south of 234-5Z, in between the two fences that make up the double enclosed Z Plant exclusion area. It is directly south of the 241-Z-361 Settling Tank. | Unknown | Associated with the 241-Z-361 Settling Tank, 216-Z-1, 216-Z-2, 216-Z-3, 216-Z-1A, 216-Z-12, and 216-Z-18. | The Z Plant fenced exclusion area is covered with gravel. The concrete lid of the diversion box is visible above ground. The unit is buried to a depth of 2.7 m (9 ft), and its upper surface (a thick concrete lid) is slightly above ground level. | Valve Pit | none | not available | not available | none |
| 71 | 200-W-59 | 200-W-59,<br>Z-Plant Diversion Box #2 | Z Plant Diversion Box #2 is located southwest of the 234-5Z Building, between the two fences that make up the double enclosed Z Plant exclusion area. It is west of the 241-Z-361 Settling Tank and directly north of the 216-Z-12 Crib. | N/A | Associated with 216-Z-361, 216-Z-12, and 200-W-58. | The structure is buried with its concrete lid slightly above ground level. The Z Plant fenced exclusion area is covered with gravel. | Valve Pit | none | not available | not available | 1976: 5000 dpm at 17 ft bgs found when drilled two wells near the crib pipelines and Diversion Box |
| 72 | HSVP | HSVP,<br>Hot Semiworks Valve Pit,<br>201-C Diversion Box,<br>Semiworks Valve Pit | This valve pit is adjacent to the remains of the 201-C Building and southeast of the main canyon area. It is located within the 200-E-41 surface stabilized area. | 1951 – 1986 or 1952 to 1963 | Associated structures include the 201-C Building, valves, transfer lines, the 244-CR Vault, C Tank Farm, and the 241-CX-70 Tank. Also associated with 200-E-41 Stabilized Area. | The site is a sealed, concrete-filled, vertically configured, stainless-steel cylinder that is buried beneath the ash barrier that was placed over the decommissioned 201-C Process Building (see 200-E-41). The surface-stabilized area is posted with URM area signs. The valve pit is not separately marked or posted. | Valve Pit | none | not available | Diversion box may contain about 23 kg (50 lb) of lead shielding. | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | 200-E-56 | 200-E-56, 241-C Waste Line Leak adjacent to 201-C, Waste Line Leak #1 | The waste line leak was adjacent to the east side of the 201-C Building. | not specified | The site is associated with 200-E-41. | HW-52860 states that Teflon flange gaskets on the SS underground waste line from 201-C to the C Tank Farm developed leaks. The leaks caused the underground area next to the east side of the 201-C Building and an underground area near the east facility fence to become contaminated (see 200-E-57). Radiation readings in 1957 were greater than 100 rad/h at a depth of 3.66 m (12 ft) adjacent to the 201-C Building and near the fence. The underground waste line was abandoned, and bypass sections were installed. New sections of pipeline were installed south of the leaking sections. The area adjacent to the 201-C Building has been surface stabilized with fly ash. The stabilized area has been given the site code 200-E-41 and is posted as a URM. The release site is not separately marked or posted and may be combined with 200-E-41. When the facility was operating, the area was enclosed in a fence. A second fence, attached to the 201-C Building, formed areas known as the "A" Court Yard and "C" Court Yard. | Unplanned Release | 200-E-57 | not available | not available | Maximum contamination levels in 1957 were greater than 100 rad/h at a depth of 3.66 m (12 ft). Some contaminated soil was removed when the bypass pipelines were installed. |
| 74 | 200-E-57 | 200-E-57, 241-C Waste Line Leak east of 201-C, Waste Line Leak #2 | This release occurred at an underground waste line located east of the 201-C Building, adjacent to the east Hot Semiworks Facility fence. The fence no longer exists. | not specified | The site is associated with 200-E-41. | HW-52860 states that Teflon flanges on the 5 cm (2-in.) SS underground waste line from 201-C to the C Tank Farm leaked and caused the soil beneath the line to become contaminated. One leaking flange was located near the Hot Semiworks Facility fence. The sketch attached to HW-52860 indicates an underground contaminated area measuring 9 m (30 ft) long. Radiological readings in 1957 ranged from 6 rad/h at a depth of 0.3 m (1 ft) to greater than 100 rad/h at a depth of 4.5 m (15 ft) at this location. The document states that the line also leaked in an area adjacent to the east side of the 201-C Building (see 200-E-56). The underground waste line was abandoned, and bypass sections were installed. New sections of pipeline were installed south of the leaking sections. The area around the Hot Semiworks Facility has been surface stabilized with fly ash. The stabilized area is known as 200-E-41 and is posted with URM signs. This release site is not separately marked or posted and may be combined with 200-E-41. When the facility was operating, the area was enclosed in a fence. A second fence, attached to the 210-C Building, formed areas known as "A" Court Yard and "C" Court Yard. | Unplanned Release | 200-E-56 | area 9 m (30 ft) long | not available | Maximum contamination levels in 1957 were greater than 100 rad/h at a depth of 4.5 m (15 ft). Some contaminated soil was removed when the bypass pipelines were installed. |
| 75 | 200-E-135 | 200-E-135, Contamination Area South of C Tank Farm | The site is located south of 7th Street and southwest of the C Tank Farm. | not specified | One direct-buried 12-in. cooling water pipeline is known to be in area; other sources are likely. | An abandoned, aboveground steam pipe is located inside the posted area. The DynCorp ISVAC group submitted this CA as a Discovery Site because of growing contaminated vegetation. Growing contaminated vegetation usually suggests the presence of an underground pipeline. The drawings reviewed found one 30 cm (12-in.) diameter "Direct Buried" cooling water line near where one of the tumbleweeds was found. The line passes through the eastern end of the posted CA. It may be a contributing source of contamination. However, the large size of the posted area indicates that other sources (currently unknown) are likely. In September 2000, three growing, contaminated tumbleweeds were found inside the posted area. The maximum contamination level was 1000 c/min above background. All of the contaminated weeds were detached from the ground and removed by the DynCorp ISVAC group in September 2000. An assessment survey was performed in April 2002 and found maximum direct readings of 5,000 and 100,000 c/min inside the posted area. In July 2002, the area was surface stabilized and downposted to a URM. | Unplanned Release | none | 102.4 x 50 m (336 x 164 ft); irregular | not available | April 2002: maximum direct readings up to 100,000 cpm. |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | 200-W-9 | 200-W-9, Project W291 Excavation VCP Contamination | The site is located in the 200 West Area, near the southeast corner of the 221-T Building. It is 42 m (138 ft) north of 23rd Street. | 1994 | The 25 cm (10-in.) VCP carried chemical sewer effluent from 291-T, 222-T, and 224-T to the 216-T-3 Crib. | An old VCP was uncovered while excavating for the T Plant manhole MH T-2 for the new waste line from T Plant to the 200 Areas Treated Effluent Disposal Facility (Project W-291). The pipeline was left in the excavation. The site currently is a gravel area with two metal caissons. The area is not marked or posted. The tops of the caissons are labeled MH T-1 and MH T-2. The contamination was found on October 11, 1994. The old VCP is assumed to be a 222-T chemical sewer. | Unplanned Release | none | 1.83 x 1.52 m (6 x 5 ft) | not available | 1994 rad survey reported 3000 dpm beta/gamma on 100 $cm^2$ (15.5 $in^2$) smear, 5500 dpm direct reading. |
| 77 | 200-W-15 | 200-W-15, S-Plant Project W-087 Hexone Discovery | The site is located ~18 m (59 ft) southwest of the southwest corner of REDOX (202-S). | not specified | 202-S REDOX, 222-S, and the 244-S Double-Contained Receiver Tank are associated with the site. | In June 1995, while excavating pipe trench for Project W-087 (new transfer lines from 222-S to the 244-S Double-Contained Receiver Tank), a dark 4.6 cm (3-in.) thick layer of soil was noted at about 0.6 m (2 ft) depth. It was determined to be hexone and surfactants. The hexone soil was stockpiled and returned to the excavation after the pipe was installed in the trench. The pipe trench where the hexone soil was found has been backfilled to grade with soil originally removed from the excavation. Hexone-contaminated soil also was put back into the excavation. Currently there is no visual evidence of this excavation on the surface. The area is now under asphalt. It is not marked or posted. Hexone was used in the adjacent facility (202-S REDOX). | Unplanned Release | none | 12.19 x 2.44 m (40 x 8 ft) | not available | none |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 78 | UPR-200-E-79 | UPR-200-E-79,<br>UN-216-E-7,<br>242-B to 207-B Line Break,<br>UN-200-E-79 | The area where the release occurred is delineated by light-duty posts and chain measuring approximately 7.6 m (25 ft) wide and 61 m (200 ft) long. It is posted with URM area signs. | 1953 | The site is associated with the 207-B Building; leaking waste line (4-in. cast iron) that runs from 242-B to 207-B. | In June 1953, five leaks were discovered in the waste line that runs from 242-B to 207-B. Contamination levels up to 2,500 c/min were measured at the points of emission of water from the ground. The area where the release occurred is delineated. | Unplanned Release | none | 61 x 7.6 m (200 x 25 ft) | Release consisted of 10 Ci of mixed fission products from the pipeline. | none |
| 79 | UPR-200-W-14 | UPR-200-W-14,<br>Waste Line Leak at 242-T Evaporator,<br>UN-200-W-14 | The 1952 release occurred in an underground pipeline, causing water to be observed on the surface, east of the TY Tank Farm. The exact location was not documented. The mapping coordinates have been estimated. | 1952 | The release is associated with the 242-T Evaporator, 207-T Basin, and 200-W-78. | In October 1952, a steam coil in the 242-T Waste Evaporator Tank caused ground contamination along the surface above the leaking cast-iron pipe that carries cooling water and steam condensate from the Waste Evaporator Building to the 207-T Retention Basin. The site is described as the surface above the waste line between the 242-T Evaporator and the 207-T Retention Basin. H-2-44511 shows a cast-iron pipeline connecting the evaporator with the retention basin. The pipeline carried steam condensate from the building to the basin. The line runs north to south along the east side of the TY Tank Farm, parallel to an encased waste transfer line. The release site is not specifically marked or posted. However, several areas of contamination were identified along the east side and northeast of the TX/TY Tank Farms in 2000 and 2001 by the DynCorp ISVAC group (site code 200-W-78). The areas were stabilized with clean dirt and posted as a URM area. Because the exact location of this 1952 UPR is not documented, it is possible that one of the areas stabilized in 2001 is in the same location as the 1952 line leak. The mapping coordinates for the 1952 line leak have been estimated from the limited information provided. HW-60807, written in 1959, states that the area was posted at intervals with Underground Contamination signs. The document provided a hand-drawn sketch of the 200 West Area with a dot indicating UPR locations. This release is indicated on the sketch as being located east of the TY Tank Farm, but it cannot be precisely located from this sketch. The coordinates for this UPR have been estimated. In 1999, 2000, and 2001, the DynCorp ISVAC group attempted to mark all underground lines in the 200 East and 200 West Area. During their activities, many areas of contamination were identified above the underground lines being marked. The CAs were posted and later stabilized and changed to URMs. It is possible that one of these areas is in the same location as this 1952 release. The leak in the line was repaired in 1952, and the contaminated areas were covered with about a foot of clean soil and gravel. | Unplanned Release | none | not available | not available | none |

Table D-2. Waste Information Data System Summary for 200-IS-1 Operable Unit Pipeline Systems. (16 Pages)

| Count | Site Code | Site Names | Location | Dates of Operation | Associated Facilities or Structures | General Description | Site Type | Associated UPR Waste Site(s) | Site Dimensions/ Area | Contaminant Inventory/Volume Released | Radiation Survey/Soil Sampling Information |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | UPR-200-W-99 | UPR-200-W-99, UN-216-W-7, 241-153-TX Diversion Box Contamination Spread, UN-200-W-99 | The release site is located east of the TX Tank Farm, extending approximately 69 to 91 m (75 to 100 yd) east of Camden Avenue. | 1966 | Associated with the 241-TX-153 Diversion Box and Camden Avenue | UPR-200-W-99 occurred on September 21, 1966. Two plumes of airborne contamination from the 241-TX-153 Diversion Box floated northeast and southeast. The releases contaminated the ground and road on both sides of Camden Avenue. The total length of contamination was identified to be 228 m (750 ft) north and south along Camden Avenue. The contamination extended a maximum of 91 m (300 ft) east of Camden Avenue. The maximum contamination found was 700 mrem/h. The area on the east of Camden Avenue, east of the TX Tank Farm, was stabilized with soil and grass. It is marked with URM signs. In 1966, the road contamination was covered with a new tar mat, and the sides of the road were fixed with tar. The area on the west side of Camden Avenue, adjacent to the tank farm fence, was covered with gravel, but was recontaminated by windblown particulates from the TX Tank Farm in 1993. In 2001, this area was no longer marked or posted. In 1976, a road grader was used on the soil east of Camden Avenue to push the contamination into windrows. Test plots in this area revealed a thin layer of Sr-90 particles present. The area east of Camden Avenue was surface stabilized in 1990 with clean backfill and grass. This area is surrounded with URM signs and is maintained by Bechtel Hanford, Inc. | Unplanned Release | none | 228.6 x 91.44 m (750 x 300 ft); stabilized area measures approximately 228 x 44 m. | Airborne particles containing approximately 1 Ci Sr-90, with maximum readings up to 700 mrad/h. | none |

Teflon is a trademark of E.I. du Pont de Nemours and Company, Wilmington, Delaware.
H-2-44511 Series, *Area Map – 200 West Area Facilities*.
HW-52860, *Standby Status Report Hot Semiworks Facility*.
HW-60807, *Unconfined Underground Radioactive Waste and Contamination in the 200 Areas - 1959*.

CA = Contamination Area.
cpm = counts per minute.
dpm = disintegrations per minute.
DynCorp = DynCorp Tri-Cities Services, Inc.
HSVP = Hot Semiworks Valve Pit.
IMUST = Inactive Miscellaneous Underground Storage Tank.
ISVAC = Integrated Soil, Vegetation, and Animal Control.
MH = manhole.
N/A = not applicable.
PUREX = Plutonium-Uranium Extraction Plant.
REDOX = Reduction-Oxidation Plant.
SS = stainless steel.
UNH = uranyl nitrate hexahydrate.
UPR = unplanned release.
URM = Underground Radioactive Material (area).
VCP = vitrified clay pipeline.
WIDS = *Waste Information Data System* database.

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